federal register

THURSDAY, JUNE 28, 1973
WASHINGTON, D.C.

Volume 38 ■ Number 124

PART III

# ENVIRONMENTAL PROTECTION AGENCY

■

## Control of Air Pollution From New Motor Vehicles and New Motor Vehicle Engines

### Miscellaneous Amendments

## Title 40—Protection of Environment

## CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

## PART 85—CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLES AND NEW MOTOR VEHICLE ENGINES

### Miscellaneous Amendments

On January 15, 1972 (37 FR 669) various amendments to the motor vehicle regulations were published. These amendments were integrated into the full regulations in the recodification and compilation of November 15, 1972 (37 FR 24250). The need for a number of technical amendments has been identified. These amendments, and corrections to the November 15, 1972 recompilation, are set forth in this publication and are described in the table below.

The amendments have been incorporated into the appropriate subparts in accordance with their applicability to light duty vehicles or to heavy duty engines. Those provisions which have applicability to more than one type of vehicle or engine, or which are applicable to more than one model year, are repeated in each applicable subpart for each model year. Those sections of each subpart applicable to the 1973 model year have not been repeated herein but may be found at 37 FR 24250 (November 15, 1972). For the first time, regulations applicable to 1974 model year light duty vehicles are printed in full.

The Agency finds that good cause exists for omitting as unnecessary and impracticable a notice of proposed rule making, public rule making procedure and postponement of effective date in the issuance of these amendments, in that (1) they are designed to correct and clarify the regulations; (2) to the extent substantive revisions are made they are of minor regulatory impact and, for the most part, reflect existing operating procedures; and (3) considerations of lead time for the 1975 model year dictate immediate promulgation.

EXPLANATION OF TECHNICAL AMENDMENT CHANGES

| Section | Change | Reason |
|---|---|---|
| 1. § 85.001 | remove exemption for vehicles with engine displacement less than 50 cubic inches. | error in 11/15/72 recompilation; exemption had only been applicable through the 1972 model year. |
| 2. § 85.002(a)(21) | revise "zero mile" definition to include limitation on engine operation. | clarifies that the adjustment period prior to the zero mile test may not include excessive break-in of the engine. |
| 3. § 85.002(a)(26) and (a)(27), § 85.702 (a)(18) and (a)(19), § 85.8(a)(23) and (a)(24), and § 85.902(a)(23) and (a)(24). | add definition of scheduled and unscheduled maintenance. | clarifies meaning and application of these terms. |
| 4. § 85.074-1(a)(ii) | remove the ".0" from the "39.0 grams per vehicle mile" standard for carbon monoxide. | since the data calculation procedure for determining compliance with emission standards requires a rounding off to two significant figures the ".0" is unnecessary. |
| 5. § 85.074-2(a) § 85.075-2(a) § 85.774-2(a) § 85.874-2(a) § 85.974-2(a). | require the manufacturers to update applications for certification as necessary. | though manufacturers are responsible for updating their applications and have, in fact, been doing so, there has been no specific requirement in the regulations. |

EXPLANATION OF TECHNICAL AMENDMENT CHANGES—Continued

| Section | Change | Reason |
|---|---|---|
| 6. § 85.074-5(g)(1), § 85.075-5(g)(1). | 1) remove requirement that weight of optional items must always be included in vehicle curb weight computation, 2) require that weight of optional items be included only on the vehicles on which the option will be available, and 3) clarify that, in the case of mutually exclusive options, only the weight of the heavier option will be included in vehicle curb weight computation. | 1) in those cases where the option will not be on a majority of the vehicles in the family, it may not be desirable to include the weight of the option, 2) it is contrary to the policy of representativeness of test vehicles to require a vehicle to be equipped with an option not available on the vehicle in the field, and 3) the policy of representativeness also obviates the practicality of adding weights of two mutually exclusive options. |
| 7. §85.074-5(g)(2), §85.075-5(g)(2). | 1) remove requirement that optional items must always be installed on the vehicle, 2) require options to be installed only on vehicles on which the option will be available, and 3) list examples of items expected to affect emissions. | 1) in those cases where the option will not be on a majority of the vehicles in the family, it may not be desirable to require the installation of the item on the test vehicle, 2) it is contrary to the policy of the representativeness of test vehicles to require a vehicle to be equipped with an option not available on the vehicle in the field, and 3) examples given to clarify intent of the paragraph. |
| 8. §85.074-5(g)(3), §85.075-5(g)(3). | add provision that optional items which affect emissions but which are expected to be equipped on less than 33 percent of production vehicles need not, unless specifically required by EPA, be installed on test vehicles. | helps to assure that vehicles represent a majority of the production vehicles certified under the engine family. |
| 9. §85.074-6(a)(1), §85.774-6(a)(1), §85.874-6(a)(1), §85.974-6(a)(1). | require scheduled maintenance on test vehicles to be included in maintenance instructions to the ultimate purchaser. | clarify the originally intended relationship between maintenance on test vehicles and that contained in maintenance instructions to the ultimate purhcaser. |
| 10. §85.074-6(a)(1)(i). | change equivalent rated horsepower per cubic inch of displacement from 1.20 to .8. | reflects 1971 industry change in method of rating horsepower. |
| 11. §85.074-6(b), §85.774-6(b), §85.874-6(b), §85.974-6(b). | 1) provide the Administrator flexibility to waive before and/or after tests for vehicle maintenance.<br>2) define term "immediately" as used in submitting test data. | 1) allows the Administrator to waive before and/or after tests when testing may cause damage to the vehicle or when test results would not be likely to provide evidence that the test vehicle should be disqualified 2) calrify how soon after a test that test data must be submitted to the Administrator. |
| 12. § 85.075-7 | 1)* require vehicles t accumulate mileage at a measured curb weight within 100 pounds of the estimated curb weight, 2) provide procedures for certifying a vehicle at the next higher inertia weight. | 1) assures similarity of actual test vehicle to that described in the application, 2) give manufacturer certification flexibility for vehicles whose loaded weight approaches the limits specified in the regulation. |
| 13. § 85.074-7(d)(1), § 85.075-7(d)(1). | 1) require manufacturer to provide Administrator an explanation of voiding emission tests, 2) provide for the Administrator to judge appropriateness of voiding a test, 3) require consistent number of tests at each test point, up to three tests and 4) define term "immediately" as used in submitting test data. | 1) provide basis for determining whether a test was properly voided, 2) clarify Administrator's authority to determine whether test was properly voided, 3) specify in the regulations that manufacturers may conduct multiple tests to give better statistical assurance of validity of test results and 4) clarify how soon after a test that test data must be submitted to the Administrator. |

Footnotes at end of table.

EXPLANATION OF TECHNICAL AMENDMENT CHANGES—Continued

| Section | Change | Reason |
|---|---|---|
| 14. § 85.074-7(d)(2), § 85.075-7(d)(2). | specify precision and method of rounding off test results. | provide information on method to calculate deterioration factor and compliance with emission standard. |
| 15. § 85.074-9(d), § 85.075-9(d), § 85.774-9(d), § 85.874-9(d), § 85.974-9(d). | qualify the requirement for all emission control systems to be functioning to provide for system malfunction or component failure and specify that any maintenance performed must be in accordance with the regulatons. | recognize that vehicles whose emission control systems are malfunctioning are not out of compliance with the regulations, so long as maintenance is performed in accordance with the regulations. |
| 16. § 85.074-11(b)(1), § 85.075-11(b)(1). | specify that any maintenance performed to correct leaks must be done in accordance with the regulatons. | clarify the scope of the maintenance provisions of the regulations. |
| 17. § 85.074-12(c), § 85.075-12(c). | clarify that the test vehicle may be used to set dynamometer horsepower if necessary. | simplify test procedure by avoiding necessity to use a dummy vehicle to set dynamometer horsepower. |
| 18. § 85.074-13(a)(4), § 85.075-13(a)(4). | clarify that the heating of the fuel in the tank should be at a constant rate of change of temperature with respect to time. | correction to reflect method intended by regulation. |
| 19. § 85.074-15(a), § 85.075-15(a). | specify that all accessories are to be turned off when the vehicle is started. | clarify that accessories must be off when the vehicle is started. |
| 20. § 85.074-15(e)(3), § 85.075-15(e)(3). | clarify that air conditioning need be equiped only on those vehicles which are intended to be offered with air conditioning in production. | make consistent with revision of § 85.074-5(g)(1) and § 85.075-5(g)(1). |
| 21. § 85.074-15(g), § 85.075-15(g). | 1) specify that emission samples may not be taken during practice runs and 2) specify that practice runs may be used to make sampling system adjustment, such as those to assure proper back pressure. | 1) prohibit abuse of practice run procedures. 2) assure proper performance of equipment. |
| 22. § 85.074-15(i), § 85.075-15(j). | specify that changes to dynamometer horsepower settings must be made within 1 hour of the test. | insure that horsepower settings are accurate. |
| 23. § 85.074-19(b)(1), § 85.075-19(b)(1). | remove required "kick-down" time when not specified in owners manual. | conform to recommendations in owners manual. |
| 24. § 85.074-19(b)(2), § 85.075-19(b))2). | remove required choke operation when not specified in owners manual. | conform to recommendations in owners manual. |
| 25. § 85.074-19(c), § 85.075-19(c). | remove "more" use of choke and throttle..... | make consistent with (b)(1) and (b)(2) above, since no throttle or choke may be used under those provisions. |
| 26. § 85.074-20(b), §85.075-20(b). | add provision that use of other types of constant volume samplers may be used with the advance approval of the Administrator. | provide flexibility in choice of testing equipment. |
| 27. § 85.074-20(b)(2), § 85.075-20(b)(2). | change static pressure variation limit to ± 5 inches of water unless manufacturer requests a tighter tolerance. | change reflects recognition that closer measurement is unnecessary for most vehicles; if manufacturer requests closer measurement under section 8, EPA will agree to it. |

EXPLANATION OF TECHNICAL AMENDMENT CHANGES—Continued

| Section | Change | Reason |
|---|---|---|
| 28. § 85.074-20(b)(5), § 85.075-20(b)(5). | provide for use of flow calibration techniques approved in advance by the Administrator. | allow flexibility in use of flow calibration technique. |
| 29. Figures A74-1, A75-1. | remove Optional Continuous Sampling Line. | prevent use of certification tests for diagnostic purposes. |
| 30. Figure A74-2..... | replace diagram with one appearing in 7/2/71 FEDERAL REGISTER. | wrong diagram appeared in 11/15/72 recompilation. |
| 31. § 85.074-20(b)(9), § 85.075-20(b)(9). | remove reference to Optional Continuous Sampling Line. | prevent use of certification tests for diagnostic purposes. |
| 32. § 85.074-22(f), § 85.075-22(f). | 1) add requirement for listing estimated curb weight; 2) change language for description of fuel system. | 1) estimated curb weight is needed to set proper inertia and horsepower; 2) fuel system language changed to include nonconventional carburetted engines. |
| 33. § 85.074-22(h), § 85.075-22(h). | provide for use of a reference to a test cell number in lieu of repetitious recording of pertinent instrument information. | provides means to dispense with repetitious recording of pertinent instrument information. |
| 34. § 85.074-22(j), § 85.075-22(j). | remove requirement to record temperature of the air in front of the radiator. | information has been determined to be unnecessary. |
| 35. § 85.074-22(l), § 85.075-22(l). | remove requirement to record temperature continuously. | recording of the temperature set point is sufficient to provide necessary data. |
| 36. § 85.074-23(a)(3), § 85.075-23(a)(3). | 1) allow for adjustment of electronic gain control 2) remove requirement for analyzer operating range to be calibrated so that analyzed deflection is in upper two-thirds of the scale. | 1) permit adjustment of optional instrumentation 2) requirement has been determined to be unnecessary. |
| 37. § 85.074-23(a)(6), § 85.075-23(a)(6). | provide new method to determine NOx converter efficiency. | new procedure is easier and less expensive than present procedure. |
| 38. § 85.074-28(c), § 85.075-28(c). | 1) specify that only valid emission data may be used to determine emission control compliance 2) include data from tests conducted in connection with maintenance approved by the Administrator in the determination of emission control compliance, when specified by the Administrator 3) specify method for rounding off numbers. | 1) and 2) clarify what data are used in deterioration factor calculations; 3) adopt ASTM procedure. |
| 39. § 85.074-29(b)(1), § 85.075-29(b)(1). | specify that manufacturer's data will not be used to determine compliance with emission standards at those test points where the Administrator tests the vehicle. | clarify procedure used to calculate compliance with emission standards. |
| 40. § 85.074-29(b)(3), § 85.075-29(b)(3). | specify that the emission data vehicle must be within manufacturer's specifications as indicated in the application for certification to be shown on the vehicle label and provide a means for adjusting the vehicle to such specifications prior to the test. | provide a means for assuring that the emission data vehicle is adjusted to proper specifications prior to running the first emissions test. |

EXPLANATION OF TECHNICAL AMENDMENT CHANGES—Continued

| Section | Change | Reason |
|---|---|---|
| 41. § 85.074-30(a)(2), § 85.075-30(a)(2): | specify the length of the certificate of conformity to be one model year. | clarify that the effectiveness of the certificate of conformity is one model year, not one calendar year. |
| 42. § 85.074-33(a), § 85.075-33(a): | specify that running changes must be approved for parameters listed in paragraph 5(a)(3) and 5(b)(3). | correct error in 11/15/72 recompilation. |
| 43. § 85.075-5(b)(2)----- | removes requirement that if any single displacement control system represents over 70 percent of projected family sales, two emission data vehicles must be selected; permits the Administrator to make such selection if total family sales are high. | provision was discriminatory against manufacturers with an undiversified product line. |
| 44. § 85.075-5(c)(2)----- | delete provision requiring two durability vehicles if a particular engine-system combination is used in only one engine family. | 1) provision was discriminatory against manufacturers with an undiversified product line 2) since data from durability vehicles of the same engine-system combination in different engine families are not compared, the requirement is unnecessary. |
| 45. § 85.075-10(b)----- | specify minimum lead content for mileage accumulation fuel. | reflect average lead levels of commercially available unleaded fuels, allowing for some test variability and lack of tight manufacturer control over specific lead levels. |
| 46. § 85.075-14(b)----- | correct language in paragraph----- | error in 11/15/72 recompilation. |
| 47. § 85.075-24(b)(12)--- | specify when to turn engine off----- | provision omitted from 11/15/72 recompilation. |
| 48. § 85.774-9(b)----- | correct introductory description of test procedure. | reflect change in test procedure from concentration measurement to mass emissions measurement. |
| 49. § 85.774-13(b)----- | provide for use of other types of sampling and analytical systems with the advance approval of the Administrator. | provide flexibility in choice of testing equipment. |
| 50. § 85.874-7(e)----- | delete paragraph----- | error in 11/15/72 recompilation; paragraph properly found at § 85.874-9(d). |
| 51. § 85.874-15----- | reinsert paragraph providing for calibration of instruments. | paragraph omitted from 11/15/72 recompilation. |
| 52. § 85.974-7(g)(1), (g)(2), (h). | reinsert paragraphs providing for testing by the Administrator, with some minor editorial changes for clarity. | paragraphs omitted from 11/15/72 recompilation. |
| 53. § 85-974-9(d)----- | reinsert paragraph previously found at § 85.974(g). | error in 11/15/72 recompilation. |
| 54. § 85.974-13(a)----- | provide for use of other types of sampling and analytical systems with the advance approval of the Administrator. | provide flexibility in choice of test equipment. |
| 55. § 85.974-16(b)(6)---- | require the test to be rerun if there is more than a 10-minute delay between test modes. | prevent excessive delays between the modes of the diesel engine test procedure since such delays could result in poor test correlativity; time limit is sufficient to correct all but major problems. |
| 56. § 85.974-18(c)----- | replace the interim NOx humidity correction factor with a new factor. | the preamble to the 1974 heavy duty diesel regulations, published on September 8, 1972 (37 FR 18262) announced that the humidity correction factor would be changed as soon as sufficient data was available; this factor has been added to the SAE Recommended Practice No. J-177. |
| 57. § 85.1602(a)(3)(ii)--- | add words "vehicle mile"----- | words omitted from 11/15/72 recompilation. |
| 58. Appendix III----- | 1) refinement of the CVS calibration procedure to allow an assessment of the quality of the data 2) Other changes to further define techniques, equipment and tolerances which should be used to achieve satisfactory calibrations 3) A list of possible sources of errors encountered on a tracer gas injection test to help laboratories troubleshoot their systems. | the new procedure displays the CVS calibration data in a form which allows assessment of the quality of the calibration. By this method, important CVS calibration and use parameters can be compared from one laboratory to another. |

* Vehicles which have accumulated mileage prior to the effective data of these regulations are subject to this requirement only after such effective date.

Part 85 of Chapter I, Title 40 of the Code of Federal Regulations as applicable beginning with the 1974 model year is amended as follows, effective upon publication in the FEDERAL REGISTER (6-28-73).

The provisions of this Part 85 issued under sections 202, 206, and 301(a) of the Clean Air Act, as amended (42 U.S.C. 1857f-1, 1857f-5, and 1857g(a)).

Date: June 22, 1973.

ROBERT W. FRI,
*Acting Administrator.*

Section 85.001 through 85.075-39 are amended to read as follows:

Sec.
85.001 General applicability.
85.002 Definitions.
85.003 Abbreviations.
85.004 General standards: increase in emissions; unsafe conditions.
85.005 Hearings on certification.
85.006 Maintenance of records; submittal of information; right of entry.
85.074–1 Emission standards for 1974 model year vehicles.
85.074–2 Application for certification.
85.074–3 Approval of procedure and equipment; test fleet selections.
85.074–4 Required data.
85.074–5 Test vehicles.
85.074–6 Maintenance.
85.074–7 Mileage accumulation and emission measurements.
85.074–8 Special test procedures.
85.074–9 Test procedures.
85.074–10 Gasoline fuel specifications.
85.074–11 Vehicle and engine preparation (fuel evaporative emissions).
85.074–12 Vehicle preconditioning (fuel evaporative emissions).
85.074–13 Evaporative emission collection procedure.
85.074–14 Dynamometer driving schedule.
85.074–15 Dynamometer procedure.
85.074–16 Three-speed manual transmission.
85.074–17 Four-speed and five-speed manual transmissions.
85.074–18 Automatic transmissions.
85.074–19 Engine starting and restarting.
85.074–20 Sampling and analytical system (exhaust emissions).
85.074–21 Sampling and analytical system (fuel evaporative emissions),
85.074–22 Information to be recorded.
85.074–23 Analytical system calibration and sample handling.
85.074–24 Dynamometer test runs.
85.074–25 Chart reading.
85.074–26 Calculations (exhaust emissions).
85.074–27 Calculations (fuel evaporative emissions).
85.074–28 Compliance with emission standards.
85.074–29 Testing by the Administrator.
85.074–30 Certification.
85.074–31 Separate certification.
85.074–32 Addition of a vehicle after certification.
85.074–33 Changes to a vehicle covered by certification.
85.074–34 Alternative procedure for notification of additions and changes.
85.074–35 Labeling.
85.074–36 Submission of vehicle identification numbers.
85.074–37 Production vehicles.
85.074–38 Maintenance instructions.
85.074–39 Submission of maintenance instructions.
85.075–1 Emission standards for 1975 model year vehicles.
85.075–2 Application for certification.
85.075–3 Approval of procedure and equipment; test fleet selections.
85.075–4 Required data.
85.075–5 Test vehicles.
85.075–6 Maintenance.
85.075–7 Mileage accumulation and emission measurements.
85.075–8 Special test procedures.
85.075–9 Test procedures.
85.075–10 Gasoline specifications.
85.075–11 Vehicle and engine preparation (fuel evaporative emissions).
85.075–12 Vehicle preconditioning (fuel evaporative emissions).
85.075–13 Evaporative emission collection procedure.
85.075–14 Dynamometer driving schedule.
85.075–15 Dynamometer procedure.
85.075–16 Three-speed manual transmissions.
85.075–17 Four-speed and five-speed manual transmissions.
85.075–18 Automatic transmissions.
85.075–19 Engine starting and restarting.
85.075–20 Sampling and analytical system (exhaust emissions).
85.075–21 Sampling and analytical system (fuel evaporative emissions).
85.075–22 Information to be recorded.
85.075–23 Analytical system calibration and sample handling.
85.075–24 Dynamometer test runs.
85.075–25 Chart reading.
85.075–26 Calculations (exhaust emissions).
85.075–27 Calculations (fuel evaporative emissions).
85.075–28 Compliance with emission standards.
85.075–29 Testing by the Administrator.
85.075–30 Certification.
85.075–31 Separate certification.
85.075–32 Addition of a vehicle after certification.
85.075–33 Changes to a vehicle covered by certification.
85.075–34 Alternative procedure for notification of additions and changes.
85.075–35 Labeling.
85.075–36 Submission of vehicle identification numbers.
85.075–37 Production vehicles.
85.075–38 Maintenance instructions.
85.075–39 Submission of maintenance instructions.
85.076–1 Emission standards for 1976 model year vehicles.

## Subpart A—Emission Regulations for New Gasoline-Fueled Light Duty Vehicles

### § 85.001 General applicability.

The provisions of this subpart are applicable to new gasoline-fueled light duty motor vehicles, except motorcycles.

### § 85.002 Definitions.

(a) As used in this subpart, all terms not defined herein shall have the meaning given them in the Act:

(1) "Act" means Part A of title II of the Clean Air Act, 42 U.S.C. 1857 f–1 through f–7, as amended by Public Law 91–604.

(2) "Administrator" means the Administrator of the Environmental Protection Agency or his authorized representative.

(3) "Model year" means the manufacturer's annual production period (as determined by the Administrator) which includes January 1 of such calendar year: *Provided*, That if the manufacturer has no annual production period, the term "model year" shall mean the calendar year.

(4) "Gross vehicle weight" means the manufacturer's gross weight rating for the individual vehicle.

(5) "Light duty vehicle" means any motor vehicle either designed primarily for transportation of property and rated at 6,000 pounds GVW or less or designed primarily for transportation of persons and having a capacity of 12 persons or less.

(6) "Off-road utility vehicle" means a light duty vehicle which incorporates special features for off-road operation such as four-wheel drive.

(7) "Motorcycle" means any light duty vehicle having a seat or saddle for the use of the rider and designed to travel on not more than three wheels (includling any tricycle arrangement) in contact with the ground and weighing less than 1,500 pounds.

(8) "Vehicle curb weight" means the actual or the manufacturer's estimated weight of the vehicle in operational status with all standard equipment, and weight of fuel at nominal tank capacity, and the weight of optional equipment computed in accordance with § 85.073–5(g).

(9) "Loaded vehicle weight" means the vehicle curb weight of a light duty vehicle plus 300 pounds.

(10) "System" includes any motor vehicle engine modification which controls or causes the reduction of substances emitted from motor vehicles.

(11) "Engine family" means the basic classification unit of a manufacturer's product line used for the purpose of test fleet selection and determined in accordance with § 85.073–5(a).

(12) "Engine-system combination" means an engine family-exhaust emission control system-fuel evaporative emission control system (where applicable) combination.

(13) "Fuel system" means the combination of fuel tank, fuel pump, fuel lines, and carburetor, or fuel injection components, and includes all fuel system vents and fuel evaporative emission control systems.

(14) "Crankcase emissions" means airborne substances emitted to the atmosphere from any portion of the engine crankcase ventilation or lubrication systems.

(15) "Exhaust emissions" means substances emitted to the atmosphere from any opening downstream from the exhaust port of a motor vehicle engine.

(16) "Fuel evaporative emissions" means vaporized fuel emitted into the atmosphere from the fuel system of a motor vehicle.

(17) "Hot soak loss" means fuel evaporative emissions during the 1-hour hot soak period which begins immediately after the engine is turned off.

(18) "Diurnal breathing loss" means fuel evaporative emissions as a result of the daily range in temperature to which the fuel system is exposed.

(19) "Running loss" means fuel evaporative emissions resulting from an average trip in an urban area or the simulation of such a trip.

(20) "Tank fuel volume" means the volume of fuel in the fuel tank, prescribed to be 40 percent of nominal tank capacity rounded to the nearest whole U.S. gallon.

(21) "Zero (0) miles" means that point after initial engine starting (not to exceed 10 miles of vehicle operation, or one hour of engine operation) at which normal assembly line operations and adjustments are completed.

(22) "Calibrating gas" means a gas of known concentration which is used to establish the response curve of an analyzer.

(23) "Span gas" means a gas of known concentration which is used routinely to set the output level of an analyzer.

(24) "Oxides of nitrogen" means the sum of the nitric oxide and nitrogen dioxide contained in a gas sample as if the nitric oxide were in the form of nitrogen dioxide.

(25) "Useful life" means a period of use of 5 years or 50,000 miles, whichever first occurs.

(26) "Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed on a periodic basis to prevent part failure or vehicle malfunction.

(27) "Unscheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of vehicle components or systems which is performed to correct a part failure or vehicle malfunction.

### § 85.003 Abbreviations.

The abbreviations used in this subpart have the following meanings in both capital and lowercase:

Accel.—Acceleration.
ASTM—American Society for Testing and Materials.
C.—Centigrade.
C.f.h.—Cubic feet per hour.
$CO_2$—Carbon dioxide.
CO—Carbon monoxide.
Conc.—Concentration.
C.f.m.—Cubic feet per minute.
Cu. in.—Cubic inch(es).
Decel.—Deceleration.
EP—End point.
Evap.—Evaporated.
F.—Fahrenheit.
Gal.—U.S. gallon(s).
Gm.—Gram(s).
GVW—Gross Vehicle Weight.
HC—Hydrocarbon(s).
Hg—Mercury.
Hi.—High.
HP.—Horsepower.
IBP—Initial boiling point.
ID—Internal diameter.
Lb.—Pound(s).
Lb.-ft.—Pound-feet.
Min.—Minute(s).
Ml.—Milliliter(s).
M.p.h.—Miles per hour.
Mm.—Millimeter(s).
Mv.—Millivolt(s).
$N_2$—Nitrogen.
NO—Nitric oxide.
$NO_2$—Nitrogen dioxide.
$NO_x$—Oxides of nitrogen.
No.—Number.
Pb—Lead.
P.p.m.—Parts per million by volume.
P.s.i.—Pounds per square inch.
P.s.i.g.—Pounds per square inch gauge.
R—Rankine.
R.p.m.—Revolutions per minute.
RVP—Reid vapor pressure.
S.A.E.—Society of Automotive Engineers.
Sec.—Second(s).
Sp.—Speed.
SS—Stainless steel.
TEL—Tetraethyl lead.
TML—Tetramethyl lead.
V.—Volts.
Vs.—Versus.
WOT.—Wide open throttle.
Wt.—Weight.
'—Feet.
"—Inches.
°—Degrees.
%—Percent.

### § 85.004 General standards: increase in emissions; unsafe conditions.

(a) (1) Every new motor vehicle manufactured for sale, sold, offered for sale, introduced or delivered for introduction into commerce, or imported into the United States for sale or resale which is subject to any of the standards prescribed in this subpart shall be covered by a certificate of conformity issued pursuant to sections 85.073–2 through 85.073–4 and 85.073–29 through 85.073–34 of this subpart.

(b) (1) Any system installed on or incorporated in a new motor vehicle to enable such vehicle to conform to standards imposed by this subpart;

(i) shall not in its operation or function cause the emission into the ambient air of any noxious or toxic substance that would not be emitted in the operation of such vehicle without such system, except as specifically permitted by regulation; and

(ii) Shall not in its operation, function, or malfunction result in any unsafe condition endangering the motor vehicle, its occupants, or persons or property in close proximity to the vehicle.

(2) Every manufacturer of new motor vehicles subject to any of the standards imposed by this subpart shall, prior to taking any of the actions specified in section 203(a)(1) of the Act, test or cause to be tested motor vehicles in accordance with good engineering practice to ascertain that such test vehicles will meet the requirements of this section for the useful life of the vehicle.

### § 85.005 Hearings on certification.

(a) (1) After granting a request for a hearing under § 85.073–30, the Administrator will designate a Presiding Officer for the hearing.

(2) The General Counsel will represent the Environmental Protection Agency in any hearing under this section.

(3) If a time and place for the hearing have not been fixed by the Administrator under § 85.073–30, the hearing shall be held as soon as practicable at a time and place fixed by the Administrator or by the Presiding Officer.

(b) (1) Upon his appointment pursuant to paragraph (a) of this section, the Presiding Officer will establish a hearing file. The file shall consist of the notice issued by the Administrator under § 85.073–30, together with any accompanying material, the request for a hearing and the supporting data submitted therewith and all documents relating to the request for certification, including the application for certification and all documents submitted therewith, and correspondence and other data material to the hearing.

(2) The appeal file will be available for inspection by the applicant at the office of the Presiding Officer.

(c) An applicant may appear in person, or may be represented by counsel or by any other duly authorized representative.

(d) (1) The Presiding Officer upon the request of any party, or in his discretion, may arrange for a prehearing conference at a time and place specified by him to consider the following:

(i) Simplification of the issues;

(ii) Stipulations, admissions of fact, and the introduction of documents;

(iii) Limitation of the number of expert witnesses;

(iv) Possibility of agreement disposing of all or any of the issues in dispute;

(v) Such other matters as may aid in the disposition of the hearing, including such additional tests as may be agreed upon by the parties.

(2) The results of the conference shall be reduced to writing by the Presiding Officer and made part of the record.

(e) (1) Hearings shall be conducted by the Presiding Officer in an informal but orderly and expeditious manner. The parties may offer oral or written evidence, subject to the exclusion by the Presiding Officer of irrelevant, immaterial and repetitious evidence.

(2) Witnesses will not be required to testify under oath. However, the Presiding Officer shall call to the attention of witnesses that their statements may be subject to the provisions of title 18 U.S.C. 1001 which imposes penalties for knowingly making false statements or representations, or using false documents in any matter within the jurisdiction of any department or agency of the United States.

(3) Any witness may be examined or cross-examined by the Presiding Officer, the parties, or their representatives.

(4) Hearings shall be reported verbatim. Copies of transcripts of proceedings may be purchased by the applicant from the reporter.

(5) All written statements, charts, tabulations, and similar data offered in evidence at the hearing shall, upon a showing satisfactory to the Presiding Officer of their authenticity, relevancy, and materiality, be received in evidence and shall constitute a part of the record.

(6) Oral argument may be permitted in the discretion of the Presiding Officer and shall be reported as part of the record unless otherwise ordered by him.

(f) (1) The Presiding Officer shall make an initial decision which shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the record. The findings, conclusions, and written decision shall be provided to the parties and made a part of the record. The initial decision

shall become the decision of the Administrator without further proceedings unless there is an appeal to the Administrator or motion for review by the Administrator within 20 days of the date the initial decision was filed.

(2) On appeal from or review of the initial decision the Administrator shall have all the powers which he would have in making the initial decision including the discretion to require or allow briefs, oral argument, the taking of additional evidence or the remanding to the Presiding Officer for additional proceedings. The decision by the Administrator shall include written findings and conclusions and the reasons or basis therefor on all the material issues of fact, law, or discretion presented on the appeal or considered in the review.

**§ 85.006 Maintenance of records; submittal of information; right of entry.**

(a) The manufacturer of any new motor vehicle subject to any of the standards prescribed in this subpart shall establish and maintain the following adequately organized and indexed records:

(1) Identification and description of all vehicles for which testing is required under this subpart.

(2) A description of all emission control systems which are installed on or incorporated in each vehicle.

(3) A description of the procedures used to test such vehicles.

(4) Test data on each emission data vehicle which will show its emissions at 0 and 4,000 miles.

(5) Test data on each durability vehicle which will show the performance of the systems installed on or incorporated in the vehicle during extended mileage as well as a record of all pertinent maintenance performed on the vehicle.

(b) The manufacturer of any new motor vehicle subject to any of the standards prescribed in this subpart shall submit to the Administrator at the time of issuance by the manufacturer copies of all instructions or explanations regarding the use, repair, adjustment, maintenance, or testing of such vehicle relevant to the control of crankcase, exhaust, or evaporative emissions, issued by the manufacturer for use by other manufacturers, assembly plants, distributors, dealers, and ultimate purchasers: *Provided*, That any material not translated into the English language need not be submitted unless specifically requested by the Administrator.

(c) The manufacturer of any new motor vehicle subject to any of the standards prescribed in this subpart shall permit officers or employees duly designated by the Administrator, upon presenting appropriate credentials and a written notice to the manufacturer:

(1) To enter, at reasonable times, any premises used during the certification procedures for purposes of monitoring tests and mileage accumulation procedures, observing maintenance procedures, and verifying correlation or calibration of test equipment, or

(2) To inspect, at reasonable times, records, files, and papers compiled by such manufacturer in accordance with paragraph (a) of this section.

A separate notice shall be given for each such inspection, but a separate notice shall not be required for each entry made during the period covered by the inspection. Each such inspection shall be commenced and completed with reasonable promptness.

**§ 85.074–1 Emission standards for 1974 model year vehicles.**

(a) (1) Exhaust emissions from 1974 model year vehicles shall not exceed:

(i) *Hydrocarbons.* 3.4 grams per vehicle mile.

(ii) *Carbon monoxide.* 39 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 3.0 grams per vehicle mile.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in § 85.074–9 through 85.074–27 and measured and calculated in accordance with those procedures.

(b) (1) Fuel evaporative emissions shall not exceed:

(i) *Hydrocarbons.* 2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in § 85.074–9 through 85.074–27 and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new motor vehicle subject to this subpart.

**§ 85.074–2 Application for certification.**

(a) An application for a certificate of conformity to the regulations applicable to any new motor vehicle shall be made to the Administrator by the manufacturer and shall be kept current and accurate by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1) Identification and description of the vehicles covered by the application and a description of their emission control systems.

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles for which certification is requested.

(3) A description of the test equipment and fuel proposed to be used.

(4) A description of the proposed mileage accumulation procedure for durability testing.

(5) A statement of recommended maintenance and procedures necessary to assure that the vehicles covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(6) At the option of the manufacturer, the proposed composition of the emission data and durability data test fleet.

**§ 85.074–3 Approval of procedure and equipment; test fleet selections.**

Based upon the information provided in the application for certification, and any other information the Administrator may require, the Administrator will approve or disapprove in whole or in part the mileage accumulation procedure and equipment and fuel proposed by the manufacturer, and notify him in writing of such determination. Where any part of a proposal is disapproved, such notification will specify the reasons for disapproval. The Administrator will select a test fleet in accordance with § 85.074–5.

**§ 85.074–4 Required data.**

The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Administrator the following information:

(a) Durability data on such vehicles tested in accordance with the applicable test procedures of this subpart, and in such numbers as therein specified, which will show the performance of the systems installed on or incorporated in the vehicle for extended mileage, as well as a record of all pertinent maintenance performed on the test vehicles.

(b) Emission data on such vehicles tested in accordance with the applicable emission test procedures of this subpart and in such numbers as therein specified, which will show their emissions after 0 miles and 4,000 miles of operation.

(c) A description of tests performed to ascertain compliance with the general standards in § 85.074–1 and the data derived from such tests.

(d) A statement that the test vehicles with respect to which data are submitted have been tested in accordance with the applicable test procedures, that they meet the requirement of such tests, and that, on the basis of such tests, they conform to the requirements of the regulations in this subpart. If such statements cannot be made with respect to any vehicle tested, the vehicle shall be identified, and all pertinent test data relating thereto shall be supplied.

**§ 85.074–5 Test vehicles.**

(a) (1) The vehicles covered by the application for certification will be divided into groupings of vehicles whose engines are expected to have similar emission characteristics. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following respects:

(i) The cylinder bore center to center dimensions.

(ii) The dimension from the centerline of the crankshaft to the centerline of the camshaft.

(iii) The dimension from the centerline of the crankshaft to the top of the cylinder block head face.

(iv) The cylinder block configuration (air-cooled or water-cooled; L–6, 90° V–8, etc.).

(v) The location of intake and exhaust valves and the valve sizes (within a ½-inch range on the valve head diameter).

(vi) The method of air aspiration.

(vii) The combustion cycle.

(3) Engines identical in all the respects listed in subparagraph (2) of this paragraph may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(i) The bore and stroke.

(ii) The surface to volume ratio of the nominally dimensioned cylinder at the top dead center position.

(iii) The intake manifold induction port size and configuration.

(iv) The exhaust manifold port size and configuration.

(v) The intake and exhaust valve sizes.

(vi) The fuel system.

(vii) The camshaft timing and ignition timing characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in subparagraphs (2) and (3) of this paragraph, the Administrator will establish families for those engines based upon the features most related to their emission characteristics.

(b) Emission data vehicles:

(1) Vehicles will be chosen to be operated and tested for emission data based upon the engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(2) Vehicles of each engine family will be divided into engine displacement-exhaust emission control system-evaporative emission control system combinations. A projected sales volume will be established for each combination for the 1974 model year. One vehicle of each combination will be selected in order of decreasing projected sales volume until 70 percent of the projected sales of a manufacturer's total production of vehicles of that engine family is represented, or until a maximum of four vehicles is selected. If any single combination represents over 70 percent, then two vehicles of that combination will be selected. The vehicle selected for each combination will be specified by the Administrator as to transmission type, fuel system and inertia weight class.

(3) The Administrator may select a maximum of four additional vehicles within each engine family based upon features indicating that they may have the highest emission levels of the vehicles in that engine family. In selecting these vehicles, the Administrator will consider such features as the emission control system combination, induction system characteristics, ignition system characteristics, fuel system, rated horsepower, rated torque, compression ratio, inertia weight class, transmission options and axle ratios.

(4) If the vehicles selected in accordance with subparagraphs (2) and (3) of this paragraph do not represent each engine-system combination, then one vehicle of each engine-system combination not represented will be selected by the Administrator. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with the control system combination in the engine family and will be designated by the Administrator as to transmission type, fuel system, and inertia weight class.

(c) Durability data vehicles:

(1) A durability data vehicle will be selected by the Administrator to represent each engine-system combination. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with that control system combination in that engine family and will be designated by the Administrator as to transmission type, fuel system and inertia weight class.

(2) If an exhaust emission control system fuel evaporative emission control system combination is used in only one engine family, an additional vehicle using that combination in that family will be selected so that the durability data fleet shall contain at least two vehicles with each combination. The additional vehicle will be selected in the same manner as vehicles selected under subparagraph (1) of this paragraph.

(3) A manufacturer may elect to operate and test additional vehicles to represent any engine-system combination. The additional vehicles must be of the same engine displacement, transmission type, fuel system and inertia weight class as the vehicle selected for that engine-system combination in accordance with the provisions of subparagraph (1) of this paragraph. Notice of an intent to operate and test additional vehicles shall be given to the Administrator not later than 30 days following notification of the test fleet selection.

(d) For purposes of testing under § 85.074–7(g), the Administrator may require additional emission data vehicles and durability data vehicles identical in all material respects to vehicles selected in accordance with paragraphs (b) and (c) of this section: *Provided*, That the number of vehicles selected shall not increase the size of either the emission data fleet or the durability data fleet by more than 20 percent or one vehicle, whichever is greater.

(e) Any manufacturer whose projected sales of new motor vehicles subject to this subpart for the 1974 model year is less than 2,000 vehicles may request a reduction in the number of test vehicles determined in accordance with the foregoing provisions of this section. The Administrator may agree to such lesser number as he determines would meet the objectives of this procedure.

(f) In lieu of testing an emission data or durability data vehicle selected under paragraph (b) or (c) of this section, and submitting data therefor, a manufacturer may, with the prior written approval of the Administrator, submit data on a similar vehicle for which certification has previously been obtained.

(g) (1) Where it is expected that more than 33 percent of an engine family will be equipped with an optional item, the full estimated weight of that item shall be included, if required by the Administrator, in the curb weight computation for each vehicle available with that option in the engine family. Where it is expected that 33 percent or less of the vehicles in an engine family will be equipped with an item of optional equipment, no weight for that item will be added in computing curb weight. In the case of mutually exclusive options, only the weight of the heavier option will be added in computing curb weight. Optional equipment weighing less than 3 pounds per item need not be considered.

(2) Where it is expected that more than 33 percent of an engine family may be equipped with an item of optional equipment that can reasonably be expected to influence emissions, then such items of optional equipment shall actually be installed, unless specifically excluded by the Administrator, on all emission data and durability vehicles in the engine family on which the option is intended to be offered in production. Optional equipment that can reasonably be expected to influence emissions are the air conditioner, power steering, power brakes, and other items determined by the Administrator.

(3) Optional equipment that can reasonably be expected to influence emissions which is utilized on 33 percent or less of the vehicles in the engine family shall not be installed on any vehicle in that engine family unless specifically required under this section.

**§ 85.074–6 Maintenance.**

(a) (1) Scheduled maintenance on the engine and fuel system of durability vehicles shall be performed only under the following provisions and shall be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle:

(i) One major engine tuneup to manufacturer's specifications may be performed at 24,000 miles (±250 miles) of scheduled driving with the following exception. On a vehicle with an engine displacement of 150 cubic inches or less (or a rating of at least 0.8 maximum rated horsepower per cubic inch of displacement), major engine tuneups may be performed at 12,000, 24,000, and 36,000 miles (±250 miles) of scheduled driving. A major engine tuneup shall be restricted to the following:

(*a*) Replace spark plugs.

(*b*) Inspect ignition wiring and replace as required.

(*c*) Replace distributor breaker points and condenser as required.

(*d*) Lubricate distributor cam.

(*e*) Check distributor advance and breaker point dwell angle and adjust as required.

(*f*) Check automatic choke for free operation and correct as required.

(*g*) Adjust carburetor idle speed and mixture.

(*h*) Adjust drive belt tension on engine accessories.

(*i*) Adjust valve lash if required.

(*j*) Check exhaust heat control valve for free operation.

(*k*) Check engine bolt torque and tighten as required.

(ii) Spark plugs may be changed if a persistent misfire is detected.

(iii) Normal vehicle lubrication services (engine and transmission oil change and oil filter, fuel filter, and air filter servicing) will be allowed at manufacturer's recommended intervals.

(iv) The crankcase emission control system may be serviced at 12,000-mile intervals (±250 miles) of scheduled driving.

(v) The fuel evaporative emission control system may be serviced at 12,000-mile intervals (±250 miles) of scheduled driving.

(vi) Readjustment of the engine choke mechanism or idle settings may be performed only if there is a problem of stalling at stops.

(vii) Leaks in the fuel system, engine lubrication system, and cooling system may be repaired.

(viii) Engine idle speed may be adjusted at the 4,000-mile test point.

(ix) Any other engine or fuel system maintenance or repairs will be allowed only with the advance approval of the Administrator.

(2) Repairs to vehicle components of the durability data vehicle, other than the engine or fuel system, shall be performed only as a result of part failure or vehicle system malfunction.

(3) Allowable maintenance on emission data vehicles shall be limited to the adjustment of engine idle speed at the 4,000-mile test point, except that other maintenance or repairs may be allowed with the advance approval of the Administrator.

(4) Where the Administrator agrees under § 85.074–7 to a mileage accumulation of less than 50,000-miles for durability testing, he may modify the requirements of this paragraph.

(b) Complete emission tests (see §§ 85.074–10 through 85.074–27) are required, unless waived by the Administrator, before and after any vehicle maintenance which may reasonably be expected to affect emisisons. These test data shall be air posted to the Administrator within 24 hours (or delivered within 3 working days) after the tests, along with a complete record of all pertinent maintenance, including a preliminary engineering report of any malfunction diagnosis and the corrective action taken. A complete engineering report shall be delivered or air posted to the administrator within ten working days after the tests. In addition, all test data and maintenance reports shall be compiled and provided to the Administrator in accordance with § 85.074–4.

(c) If the Administrator determines that maintenance or repairs performed have resulted in a substantial change to the engine-system combination, the vehicle shall not be used as a durability data vehicle.

**§ 85.074–7 Mileage accumulation and emission measurements.**

The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 85.074–15(d), the manufacturer may elect to conduct the respective emission tests at the inertia weight corresponding to the higher loaded vehicle weight.

(a) Emission data vehicles: Each emission data vehicle shall be driven 4,000 miles with all emission control systems installed and operating. Emission tests shall be conducted at zero miles and 4,000 miles.

(b) Durability data vehicles: Each durability data vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objectives of this procedure. Emission measurements from a cold start, taken in accordance with §§ 85.074–20 and 85.074–21, shall be made at the following mileage points: 0, 4,000, 8,000, 12,000, 16,000, 20,000, 24,000, 28,000, 32,000, 36,000, 40,000, 44,000, and 50,000.

(c) All tests required by this subpart to be conducted after 4,000 miles of driving or at any subsequent test point listed in paragraph (b) of this section must be conducted at any accumulated mileage within 250 miles of each of those test points.

(d)(1) The results of each emission test shall be supplied to the Administrator immediately after the test. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer. If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests. Tests between test points may be conducted as required by the Administrator. Data from all tests (including voided tests) shall be air posted to the Administrator within 24 hours (or delivered within 3 working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 85.074–4. Where the Administrator conducts a test on a durability vehicle at a test point, the results of each test will be used in the calculation of the deterioration factor.

(2) The results of all emission tests shall be recorded and reported to the Administrator using three significant figures. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E 29–67.

(e) Whenever the manufacturer proposes to operate and test a vehicle which may be used for emission or durability data, he shall provide the zero mile test data to the Administrator and make the vehicle available for such testing under § 85.074–29 as the Administrator may require before beginning to accumulate mileage on the vehicle. Failure to comply with this requirement will invalidate all test data submitted for this vehicle.

(f) Once a manufacturer begins to operate an emission data or durability data vehicle, as indicated by compliance with paragraph (e) of this section, he shall continue to run the vehicle to 4,000 miles or 50,000 miles, respectively, and the data from the vehicle will be used in the calculations under § 85.074–28. Discontinuation of a vehicle shall be allowed only with the written consent of the Administrator.

(g) (1) The Administrator may elect to operate and test any test vehicle during all or any part of the mileage accumulation and testing procedure. In such cases, the manufacturer shall provide the vehicle(s) to the Administrator with all information necessary to conduct this testing.

(2) The test procedures in §§ 85.074–10 through 85.074–27 will be followed by the Administrator. The Administrator will test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(3) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other vehicles of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(h) Emission testing of any type with respect to any certification vehicle other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

**§ 85.074–8 Special test procedures.**

The Administrator may, on the basis of a written application therefor by a manufacturer, prescribe test procedures, other than those set forth in this subpart, for any motor vehicle which he determines is not susceptible to satisfactory testing by the procedures set forth herein.

**§ 85.074–9 Test procedures.**

The procedures described in this and subsequent sections will be the test program to determine the conformity of vehicles with the standards set forth in § 85.074–1.

(a) The test consists of prescribed sequences of fueling, parking, and operating conditions. The exhaust gases generated during vehicle operation are

diluted with air and sampled continuously for subsequent analysis of specific components by prescribed analytical techniques. The fuel evaporative emissions are collected for subsequent weighing during both vehicle parking and operating events. The test applies to vehicles equipped with catalytic or direct-flame afterburners, induction system modifications, or other systems or to uncontrolled vehicles and engines.

(b) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles from a cold start. The test consists of engine startup and vehicle operation on a chassis dynamometer through a specified driving schedule, as described in Appendix I to this part. A proportional part of the diluted exhaust emissions is collected continuously, for subsequent analysis, using a constant volume (variable dilution) sampler.

(c) The fuel evaporative emission test is designed to determine fuel hydrocarbon evaporative emissions to the atmosphere as a consequence of urban driving, and diurnal temperature fluctuations during parking. It is associated with a series of events representative of a motor vehicle's operation, which result in fuel vapor losses directly from the fuel tank and carburetor. Activated carbon traps are employed in collecting the vaporized fuel. The test procedure is specifically aimed at collecting and weighing:

(1) Diurnal breathing losses from the fuel tank and other parts of the fuel system when the fuel tank is subjected to a temperature increase representative of the diurnal range;

(2) Running losses from the fuel tank and carburetor resulting from a simulated trip from a cold start on a chassis dynamometer; and

(3) Hot soak losses from the fuel tank and carburetor which result when the vehicle is parked and the hot engine is turned off.

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 85.074–6.

### § 85.074–10 Gasoline fuel specifications.

(a) Fuel having the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in exhaust and evaporative emission testing. Where the Administrator determines that the vehicles represented by a test vehicle will be operated using fuels of a different lead content or octane rating than that prescribed in this paragraph, he may consent in writing to use of a fuel otherwise substantially equivalent to the following specifications but with a different lead content or octane rating.

| Item | ASTM designation | Specifications |
|---|---|---|
| Octane, Research, min | D 1656 | 100 |
| Pb. (organic), gm./U.S. gal | D 526 | 3.1–3.3 |
| Distillation range | D 86 | |
| IPB, ° F | | 75–95 |
| 10 percent point, ° F | | 120–135 |
| 50 percent point, ° F | | 200–230 |
| 90 percent point, ° F | | 300–325 |
| EP, ° F. (max.) | | 415 |
| Sulfur, wt. percent, max | D 1266 | 0.10 |
| Phosphorus, theory | | 0.0 |
| RVP,[1] lb | D 323 | 8.7–9.2 |
| Hydrocarbon composition | D 1319 | |
| Olefins, percent, max | | 10 |
| Aromatics, percent, max | | 35 |
| Saturates | | Remainder |

[1] For testing which is unrelated to fuel evaporative emission control, the specified range is: 8.0–9.2.

(b) Fuel having the following specifications, or substantially equivalent specifications approved by the Administrator, shall be used in mileage accumulation. The octane rating of the fuel used shall be in the range recommended by the vehicle or engine manufacturer. The Reid Vapor Pressure of the fuel used shall be characteristic of the seasonal motor fuel. Where the Administrator determines that the vehicles represented by a test vehicle will be operated using fuels of a different lead content than that prescribed in this paragraph, he may consent in writing to use of a fuel otherwise substantially equivalent to the following specifications but with a different lead content.

(c) The specifications of the fuel to be used under paragraph (b) of this section shall be reported in accordance with § 85.074–2(b)(3).

| Item | ASTM Designation | Regular | Premium |
|---|---|---|---|
| Pb. (organic), gm./U.S. gal | D 526 | 2.1–3.2 | 2.1–3.2 |
| Sulfur, wt. percent | D 1266 | 0.02–0.10 | 0.02–0.10 |
| Hydrocarbon composition | D 1319 | | |
| Olefins, percent, max | | 30 | 15 |
| Aromatics, percent, max | | 40 | 40 |
| Saturates | | Remainder | Remainder |

### § 85.074–11 Vehicle and engine preparation (fuel evaporative emissions).

(a) (1) Apply appropriate leak-proof fittings to all fuel system external vents to permit collection of effluent vapors from these vents during the course of the prescribed tests. Since the prescribed test requires the temporary plugging of the inlet pipe to the air cleaner, it will be necessary to install a probe for collecting the normal effluents from this source. Where antisurge/vent filler caps are employed on the fuel tank, plug off the normal vent if it does not conveniently lend itself to the collection of vapors which emanate from it, and introduce a separate vent, with appropriate fitting, on the cap. Where the fuel tank vent line terminus is inaccessible, sever the line at a convenient point near the fuel tank and install the collection system in a closed circuit assembly with the severed ends. All fittings shall terminate in 5/16-inch ID tube sections for ready connection to the collection systems and shall be designed for minimum dead space.

(2) The design and installation of the necessary fittings shall not disturb the normal function of the fuel system components or the normal pressure relationships in the system.

(b) (1) Inspect the fuel system carefully to insure the absence of any leaks to the atmosphere of either liquid or vapor which might affect the accuracy of the test or the performance of the control system. Corrective action, if required, shall be performed in accordance with § 85.074–6 and be reported with the test results under § 85.074–4.

(2) Care should be exercised, in the application of any pressure tests, neither to purge nor load the evaporative emission control system.

(c) Prepare fuel tank for recording the temperature of the prescribed test fuel at its approximate midvolume.

(d) Provide additional fittings and adapters, as required to accommodate a fuel drain at the lowest point possible in the tank as installed on the vehicle.

### § 85.074–12 Vehicle preconditioning (fuel evaporative emissions).

Vehicles to be tested for compliance with the fuel evaporative emissions standard of this subpart shall be preconditioned as follows:

(a) The test vehicle shall be operated under the conditions prescribed for mileage accumulation, § 85.074–7, for 1 hour immediately prior to the operations prescribed below.

(b) The fuel tank shall be drained and specified test fuel (§ 85.074–10(a)) added. The evaporative emission control system or device shall not be abnormally purged or loaded as a result of draining or fueling the tank.

(c) The test vehicle shall be placed on the dynamometer and operated over a simulated trip, according to the applicable requirements and procedures of §§ 85.074–14 through 85.074–19 except that the engine need not be cold when started. The test vehicle may be used to set dynamometer horsepower, if necessary. During this operation the ambient tempearture shall be between 68° F. and 86° F.

(d) The engine and cooling fan shall be stopped upon completion of the dynamometer operation and the vehicle permitted to soak either on or off the dynamometer stand at an ambient temperature between 76° F. and 86° F. for a period of not less than 1 hour prior to the soak period prescribed in § 85.074–13(a)(1).

**§ 85.074–13 Evaporative emission collection procedure.**

The standard test procedure consists of three parts described below which shall be performed in sequence and without any interruption in the test conditions prescribed.

(a) *Diurnal breathing loss test.* (1) The test vehicle shall be allowed to "soak" in an area where the ambient temperature is maintained between 60° F. and 86° F. for a period of not less than 10 hours. (The vehicle preparation requirements of § 85.074–11 may be performed during this period.) It shall then be transferred to a soak area where the ambient temperature is maintained between 76° F. and 86° F. Upon admittance to the 76° F.–86° F. soak area, the prescribed fuel tank thermocouple shall be connected to the recorder and the fuel and ambient temperatures recorded at a chart speed of approximately 12 inches per hour (or equivalent record).

(2) The fuel tank of the prepared test vehicle, preconditioned according to § 85.074–12, shall be drained and recharged with the specified test fuel, § 85.074–10(a), to the prescribed "tank fuel volume," defined in § 85.002. The temperature of the fuel following the charge to the tank shall be 60° F.±2° F. Care should be exercised against abnormal loading of the evaporative emission control system or device as a result of fueling the tank.

(3) Immediately following the fuel charge to the tank, the exhaust pipe(s) and inlet pipe to the air cleaner shall be plugged and the prescribed vapor collection systems installed on all fuel system external vents. Multiple vents may be connected to a single collection trap provided that, where there is more than one external vent on a fuel system distinguishing between carburetor and tank vapors, separate collection systems shall be employed to trap the vapors from the separate sources. Every precaution shall be taken to minimize the lengths of the collection tubing employed and to avoid sharp bends across the entire system.

(4) Artificial means shall be employed to heat the fuel in the tank to 84° F. ±2° F. The prescribed temperature of the fuel shall be achieved over a period of 60 minutes ± 10 minutes at a constant rate of change of temperature with respect to time. After a minimum of 1 hour, following admittance to the 76° F.–86° F. soak area, the vehicle shall be moved onto the dynamometer stand for the subsequent part of the test. The fuel tank thermocouple may be temporarily disconnected to permit moving the test vehicle. Plugs shall be removed from the exhaust pipe(s) and inlet pipe to the air cleaner.

(b) *Running loss test.* (1) The vehicle shall be placed on the dynamometer and the fuel tank thermocouple reconnected. The fuel temperature and the ambient air temperature shall be recorded at a chart speed of approximately 12 inches per hour (or equivalent record).

(2) Where the only external vent(s) is located in the immediate vicinity of the carburetor air horn, such that any "running loss" emissions would be inducted into the engine, there is no requirement to collect any vapor losses during this part of the test and the vapor-loss measurement system shall be temporarily disconnected and clamped.

(3) The vehicle shall be operated on the dynamometer according to the requirements and procedures of § 85.074–14 through § 85.074–24. The engine and fan shall be turned off upon completion of the dynamometer run and the exhaust and air cleaner inlet pipes shall be replugged.

(4) Any vapor collection systems employed during this part of the test shall be left intact for their continued use during the following part. Any part of the vapor collection system disconnected during this phase of the test shall be reconnected for the following phase.

(c) *Hot soak test.* Upon completion of the dynamometer run, the test vehicle shall be permitted to soak with hood down for a period of 1 hour at an ambient temperature between 76° F. and 86° F. This operation completes the test. The traps are disconnected and weighed according to § 84.074–21.

**§ 85.074–14 Dynamometer driving schedule.**

(a) The dynamometer driving schedule to be followed consists of a nonrepetitive series of idle, acceleration, cruise, and deceleration modes of various time sequences and rates. The driving schedule is defined by a smooth transition through the speed vs. time relationships listed in Appendix I. The time sequence begins upon starting the vehicle according to the startup procedure described in § 85.074–19.

(b) The speed tolerance at any given time on the dynamometer driving schedule prescribed in Appendix I or as printed on a driver's aid chart approved by the Administrator is defined by upper and lower limits. The upper limit is 2 m.p.h. higher than the highest point on the trace within 1 second of the given time. The lower limit is 2 m.p.h. lower than the lowest point on the trace within 1 second of the given time. Speed variations greater than the tolerances (such as occur when shifting manual transmission vehicles) are acceptable provided they occur for less than 2 seconds on any one occasion. Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences. Further, speed deviations from those prescribed due to stalling are acceptable provided the provisions of § 85.074–19(f) are adhered to.

**§ 85.074–15 Dynamometer procedure.**

(a) The vehicle shall be tested from a cold start, with all accessories turned off during startup. Engine startup and operation over the driving schedule make a complete test run. Exhaust emissions are diluted with air to a constant volume and a portion is sampled continuously during the entire test run. The complete sample, collected in a bag, is analyzed for hydrocarbon, carbon monoxide, and oxides of nitrogen emissions. A parallel sample of the dilution air is similarly analyzed.

(b) During dynamometer operation, a fixed speed cooling fan shall be positioned so as to direct cooling air to the vehicle in an appropriate manner with the engine compartment cover open. The fan capacity shall normally not exceed 5,300 c.f.m. If, however, the manufacturer can show that during field operation the vehicle receives additional cooling, the fan capacity may be increased or additional fans used if approved in advance by the Administrator. In the case of vehicles with front engine compartments, the fan(s) shall be squarely positioned between 8 and 12 inches in front of the cooling air inlets (grill). In the case of vehicles with rear engine compartments (or if special designs make the above impractical), the cooling fan(s) shall be placed in a position to provide sufficient air to maintain engine cooling.

(c) The vehicle shall be nearly level when tested in order to prevent abnormal fuel distribution.

(d) Flywheels, electrical or other means of simulating inertia as shown in the following table shall be used. If the equivalent inertia specified is not available on the dynamometer being used, the next higher equivalent inertia (not to exceed 250 lbs.) available shall be used.

| Loaded vehicle weight, pounds | Equivalent inertia weight, pounds | Road load power at 50 m.p.h. horsepower |
|---|---|---|
| Up to 1,125 | 1,000 | 5.9 |
| 1,126 to 1,375 | 1,000 | 6.5 |
| 1,376 to 1,625 | 1,500 | 7.1 |
| 1,626 to 1,875 | 1,750 | 7.7 |
| 1,876 to 2,125 | 2,000 | 8.3 |
| 2,126 to 2,375 | 2,250 | 8.8 |
| 2,376 to 2,625 | 2,500 | 9.4 |
| 2,626 to 2,875 | 2,750 | 9.9 |
| 2,876 to 3,250 | 3,000 | 10.3 |
| 3,251 to 3,750 | 3,500 | 11.2 |
| 3,751 to 4,250 | 4,000 | 12.0 |
| 4,251 to 4,750 | 4,500 | 12.7 |
| 4,751 to 5,250 | 5,000 | 13.4 |
| 5,251 to 5,750 | 5,500 | 13.9 |
| 5,751 to above | 5,500 | 14.4 |

(e) Power absorption unit adjustment.

(1) The power absorption unit shall be adjusted to reproduce road load power at 50 m.p.h. true speed. The indicated road load power setting shall take into account the dynamometer friction. The relationship between road load (absorbed) power and indicated road load power for a particular dynamometer shall be determined by the procedure outlined in Appendix II or other suitable means.

(2) The road load power listed in the table above shall be used or the vehicle manufacturer may determine the road load power by the following procedure and request its use:

(i) Measuring the absolute manifold pressure of a representative vehicle, of the same equivalent inertia weight class, when operated on a level road under balanced wind conditions at a true speed of 50 m.p.h., and

(ii) Noting the dynamometer indicated road load horsepower setting required to reproduce that manifold pressure when the same vehicle is operated

on the dynamometer at a true speed of 50 m.p.h. The tests on the road and on the dynamometer shall be performed with the same vehicle ambient absolute pressure (usually barometric), i.e. within ±5 mm. Hg.

(iii) The road load power shall be determined according to the procedure outlined in Appendix II and adjusted according to the following if applicable.

(3) Where it is expected that more than 33 percent of the vehicles in an engine family will be equipped with air conditioning, the road load power listed above or as determined in paragraph (e)(2) of this section shall be increased by 10 percent for testing all test vehicles representing such engine family if those vehicles are intended to be offered with air conditioning in production.

(f) The vehicle speed (m.p.h.) as measured from the dynamometer rolls shall be used for all conditions. A speed vs. time recording, as evidence of dynamometer test validity, shall be supplied on request of the Administrator.

(g) Practice runs over the prescribed driving schedule may be performed at test points, provided an emission sample is not taken, for the purpose of finding the minimum throttle action to maintain the proper speed-time relationship, or to permit sampling system adjustments to comply with § 85.074–20(b)(2).

NOTE: When using two-roll dynamometers a truer speed-time trace may be obtained by minimizing the rocking of the vehicle in the rolls. The rocking of the vehicle changes the tire rolling radius on each roll. The rocking may be minimized by restraining the vehicle horizantally (or nearly so) by using a cable and winch.

(h) The drive wheel tires may be inflated up to 45 p.s.i.g. in order to prevent tire damage. The drive wheel tire pressure shall be reported with the test results.

(i) Changes to dynamometer horsepower settings, if required, shall be made within 1 hour of the exhaust emission measurement test phase. The test vehicle shall not be used to make this adjustment.

**§ 85.074–16 Three-speed manual transmissions.**

(a) All test conditions except as noted shall be run in highest gear.

(b) Cars equipped with free wheeling or overdrive units shall be tested with this unit (free wheeling or overdrive) locked out of operation.

(c) Idle shall be run with transmission in gear and with clutch disengaged (except first idle; see § 85.074–19).

(d) The vehicle shall be driven with minimum throttle movement to maintain the desired speed.

(e) Acceleration modes shall be driven smoothly with the shift speeds as recommended by the manufacturer. If the manufacturer does not recommend shift speeds, the vehicle shall be shifted from first to second gear at 15 m.p.h. and from second to third gear at 25 m.p.h. The operator shall release the accelerator pedal during the shift, and accomplish the shift with minimum closed throttle time. If the vehicle cannot accelerate at the specified rates, the vehicle shall be accelerated at WOT until the vehicle speed reaches the speed at which it should be at that time during the test.

(f) The deceleration modes shall be run with clutch engaged and without shifting gears from the previous mode, using brakes or throttle as necessary to maintain the desired speed. For those modes which decelerate to zero, the clutch shall be depressed when the speed drops below 15 m.p.h., when engine roughness is evident, or when engine stalling is imminent.

(g) Downshifting is allowed at the beginning of or during a power mode if recommended by the manufacturer or if the engine obviously is lugging.

**§ 85.074–17 Four-speed and five-speed manual transmissions.**

(a) Use the same procedure as for three-speed manual transmissions for shifting from first to second gear and from second to third gear. If the manufacturer does not recommend shift speeds, the vehicle shall be shifted from third to fourth gear at 40 m.p.h. Fifth gear may be used at the manufacturer's option.

(b) If transmission ratio in first gear exceeds 5:1, follow the procedure for three- or four-speed manual transmission vehicles as if the first gear did not exist.

**§ 85.074–18 Automatic transmissions.**

(a) All test conditions shall be run with the transmission in "Drive" (highest gear). Automatic stick-shift transmissions may be shifted as manual transmissions at the option of the manufacturer.

(b) Idle modes shall be run with the transmission in "Drive" and the wheels braked (except first idle; see § 85.074–19).

(c) The vehicle shall be driven with minimum throttle movement to maintain the desired speed.

(d) Acceleration modes shall be driven smoothly allowing the tranmission to shift automatically through the normal sequence of gears. If the vehicle cannot accelerate at the specified rates, the vehicle shall be accelerated at WOT until the vehicle speed reaches the speed at which it should be at that time during the driving schedule.

(e) The deceleration modes shall be run in gear using brakes or throttle as necessary to maintain the desired speed.

**§ 85.074–19 Engine starting and restarting.**

(a) The engine shall be started according to the manufacturer's recommended starting procedures. The initial 20-second-idle period shall begin when the engine starts.

(b) Choke operation:

(1) Vehicles equipped with automatic chokes shall be operated according to the instructions which will be included in the manufacturer's operating instructions or owner's manual including choke setting and "kick-down" from cold fast idle. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(2) Vehicles equipped with manual chokes shall be operated according to the manufacturer's operating instructions or owners manual.

(c) The operator may use the choke, throttle, etc. where necessary to keep the engine running.

(d) If the vehicle does not start after 10 seconds of cranking, cranking shall cease and the reason for failure to start determined. The revolution counter on the constant volume sampler (see § 85.074–24, Dynamometer test runs) shall be turned off and the sample solenoid valves placed in the "dump" position during this diagnostic period. In addition, either the positive displacement pump should be turned off or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the vehicle shall be rescheduled for testing from a cold start. If failure to start is caused by vehicle malfunction, corrective action of less than 30 minutes duration may be taken and the test continued. The sampling system shall be reactivated at the same time cranking is started. When the engine starts, the driving schedule timing sequence shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

(e) If the engine "false starts", the operator shall repeat the recommended starting procedure (such as resetting the choke, etc.).

(f) Stalling:

(1) If the engine stalls during an idle period, the engine shall be restarted immediately and the test continued. If the engine cannot be started soon enough to allow the vehicle to follow the next acceleration as prescribed, the driving schedule indicator shall be stopped. When the vehicle restarts, the driving schedule indicator shall be reactivated.

(2) If the engine stalls during some operating mode other than idle, the driving schedule indicator shall be stopped, the vehicle restarted, accelerated to the speed required at that point in the driving schedule and the test continued.

(3) If the vehicle will not restart within 1 minute, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

**§ 85.074–20 Sampling and analytical system (exhaust emissions).**

(a) *Schematic drawings.* The following figures (Figs. A74–1 and A74–2) are

schematic drawings of the exhaust gas sampling and analytical systems which will be used for testing under the regulations in this part. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems. In particular, the HC and CO instruments may be connected in series instead of in parallel.

(b) *Component description (exhaust gas sampling system).* The following components will be used in the exhaust gas sampling system for testing under the regulations in this subpart. See Figure A74–1. Other types of constant volume samplers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(1) A dilution air filter assembly consisting of a particulate (paper) filter to remove solid matter from the dilution air and thus increase the life of the charcoal filter; a charcoal filter to reduce and stabilize the background hydrocarbon level; and a second particulate filter to remove charcoal particles from the airstream. The filters shall be of sufficient capacity and the duct which carries the dilution air to the point where the exhaust gas is added shall be of sufficient size so that the pressure at the mixing point is less than 1 inch of water pressure below ambient when the constant volume sampler is operating at its maximum flow rate.

(2) A leak-tight connector and tube to the vehicle tailpipe. The tubing shall be sized and connected in such a manner that the static pressure variations in the vehicle tailpipe(s) remain within ±5 inches of water of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). Sampling systems capable of tolerances to ±1 inch of water will be used by the Administrator upon written request by the manufacturer.

(3) A heating system to preheat the heat exchanger to within ±10° F. of its operating temperature before the test begins.

(4) A heat exchanger capable of limiting the gas mixture temperature variation during the entire test to ±10° F. as measured at a point immediately ahead of the positive displacement pump.

(5) A positive displacement pump to pump the dilute exhaust mixture. The pump capacity (300 to 350 c.f.m. is sufficient for testing most vehicles) shall be large enough to virtually eliminate water condensation in the system. See Appendix III for one flow calibration technique. Other suitable calibration techniques may be used if approved in advance by the Administrator.

(6) Temperature sensor (T1) with an accuracy of ±2° F. to allow continuous recording of the temperatures of the dilute exhaust mixture entering the positive displacement pump (see § 85.074–22 (1)).

(7) Gauge (G1) with an accuracy of ±3 mm. Hg to measure the pressure depression of the dilute exhaust mixture entering the positive displacement pump, relative to atmospheric pressure.

(8) Gauge (G2) with an accuracy of ±3 mm. Hg to measure the pressure increase across the positive displacement pump.

(9) Sample probes (S1 and S2) pointed upstream to collect samples from the dilution airstream and the dilute exhaust mixture.

(10) Filters (F1 and F2) to remove particulate matter from dilution air and dilute exhaust samples.

(11) Pumps (P1 and P2) to pump the dilution air and dilute exhaust into their respective sample collection bags.

(12) Flow control valves (N1 and N2) to regulate flows to sample collection bags, at constant flow rates. The minimum sample flow rate shall be 5 c.f.h.

(13) Flowmeters (FL1 and FL2) to insure, by visual observation, that constant flow rates are maintained throughout the test.

(14) Three-way solenoid valves (V1 and V2) to direct sample streams to either their respective bags or overboard.

(15) Quick-connect leak-tight fittings (C1 and C2), with automatic shutoff on bag side, to attach sample bags to sample system.

(16) Sample collection bags for dilution air and exhaust samples of sufficient capacity so as not to impede sample flow.

(17) A revolution counter to count the revolutions of the positive displacement pump while the test is in progress and samples are being collected.

(c) *Component description (exhaust gas analytical system).* The following components will be used in the exhaust gas analytical system for testing under the regulations in this part. The analytical system provides for the determination of hydrocarbon concentrations by flame ionization detector (FID) analysis, the determination of carbon monoxide concentrations by nondispersive infrared (NDIR) analysis and the determination of oxides of nitrogen concentration by chemiluminescence (C1) analysis in dilute exhaust samples. The chemiluminescence method of analysis requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. See Appendix V. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator. See Figure A74–2.

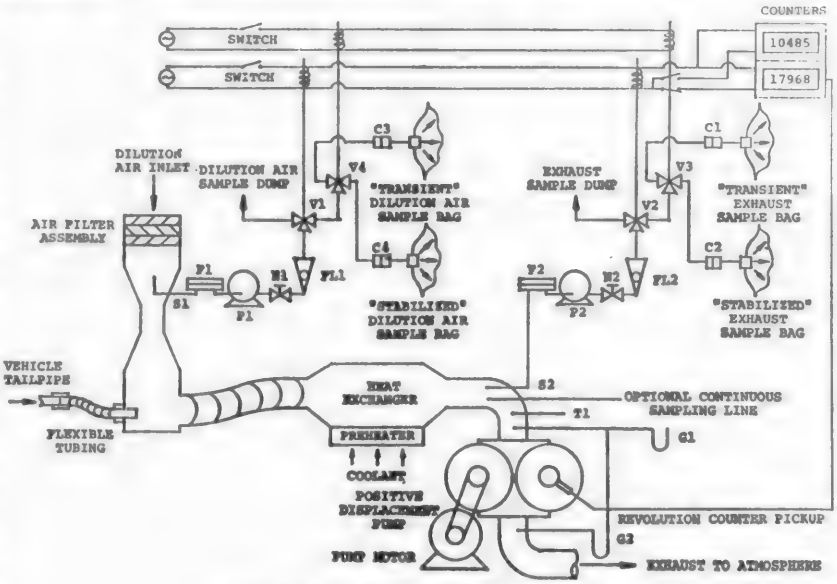



FIGURE A74–1.—Exhaust Gas Sampling System.

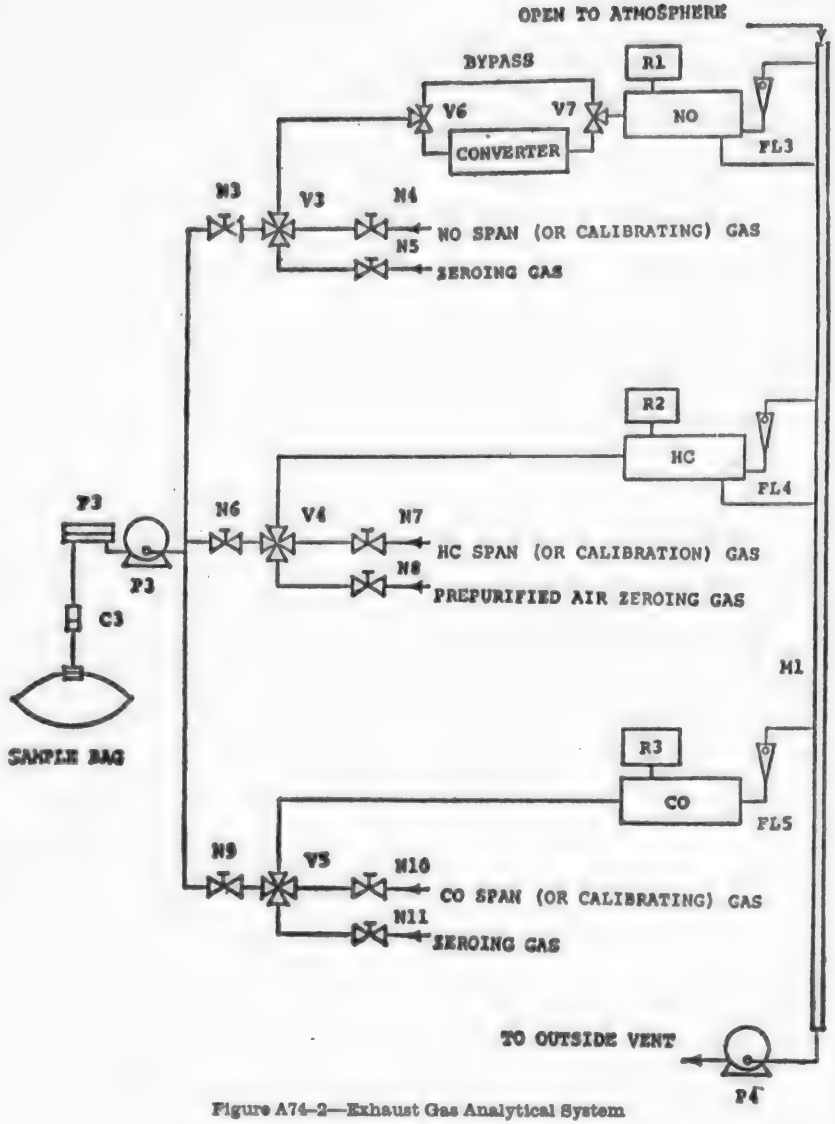



Figure A74–2—Exhaust Gas Analytical System

(1) Quick-connect leak-tight fitting (C3) to attach sample bags to analytical system.

(2) Filter (F3) to remove any residual particulate matter from the collected samples.

(3) Pump (P3) to transfer samples from the sample bags to the analyzers.

(4) Selector valves (V3, V4, and V5) for directing samples, span gases or zeroing gas to the analyzers.

(5) Flow control valves (N3, N4, N5, N6, N7, N8, N9, N10, and N11) to regulate the gas flow rates.

(6) Flowmeters (FL3, FL4, and FL5) to indicate gas flow rates.

(7) Manifold (M1) to collect the expelled gases from the analyzers.

(8) Pump (P4) to transfer expelled gases from the collection manifold to a vent external to the test room (optional).

(9) Analyzers to determine hydrocarbon, carbon monoxide and oxides of nitrogen concentrations.

(10) An oxides of nitrogen converter to convert any $NO_2$ present in the samples to NO before analysis.

(11) Selector valves (V6 and V7) to allow the sample, span, calibrating, or zeroing gases to bypass the converter.

(12) Recorders (R1, R2, and R3) or digital printers to provide permanent records of calibration, spanning and sample measurements; or, in those facilities where computerized data acquisition systems are incorporated, the computer facility printout may be used.

**§ 85.074–21 Sampling and analytical system (fuel evaporative emissions).**

(a) *Schematic drawing.* (1) The following figures (Figures A74–3, A74–4, and A74–5) are flow diagrams of typical evaporative loss collection applications.

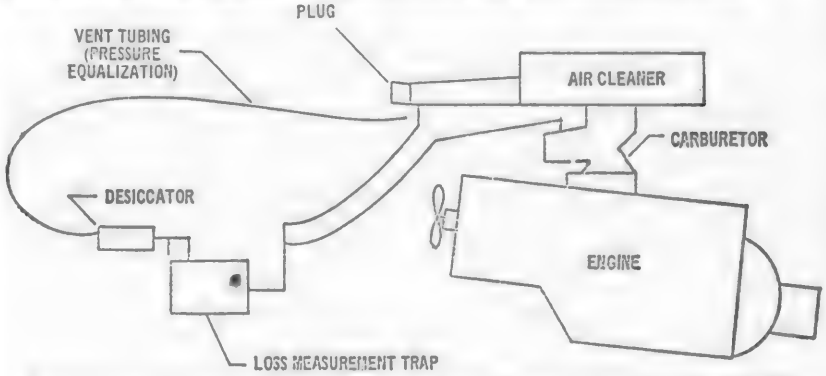



FIGURE A74–3.—Typical carburetor evaporative loss collection arrangement (schematic).

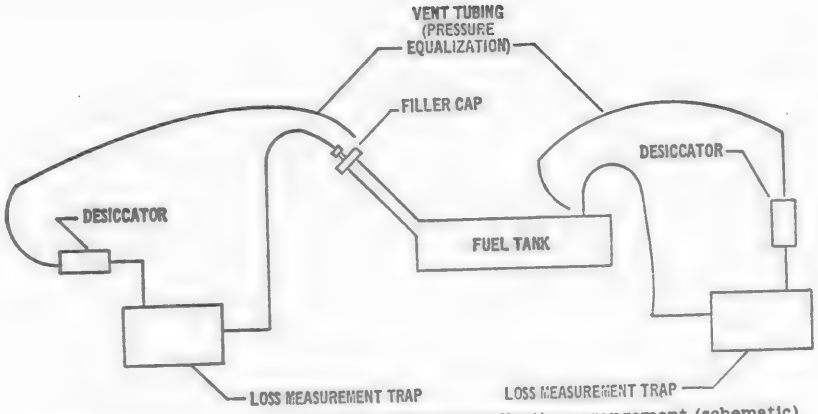



FIGURE A74–4.—Typical fuel tank evaporative loss collection arrangement (schematic).

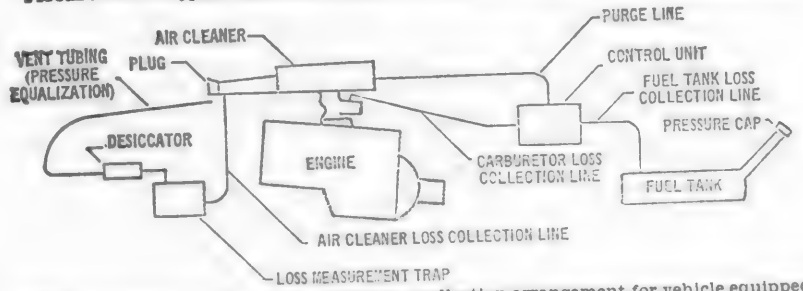



FIGURE A74–5.—Typical fuel evaporative loss collection arrangement for vehicle equipped with evaporative emission control system (schematic).

(2) Figure A74–3 represents an arrangement for collecting losses which emanate from the carburetor. Figure A74–4 depicts the means for separately collecting the vapors which emanate from the fuel tank vent line and filler cap. Figure A74–5 shows an arrangement for collecting the losses from a closed fuel system, vented to the atmosphere solely though the air cleaner, as might be the case with certain fuel evaporative emission control devices.

(3) Schematic drawings of arrangements to be employed shall be submitted in accordance with § 85.074–2(b)(3).

(b) *Collection equipment.* The following equipment shall be used for this collection of fuel evaporative emissions. (Item quantities are determined by individual test needs.)

(1) *Activated carbon trap.* See Figure A74–6 for specifications of one design; other configurations may be used: *Provided,* That they give demonstrably equivalent results.

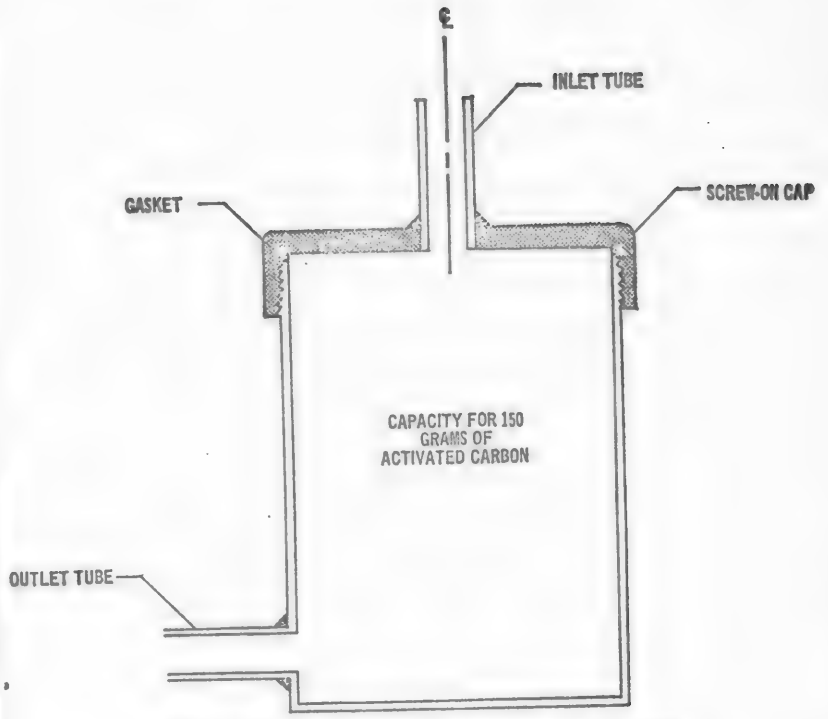



FIGURE A74–6.—Typical activated carbon trap (schematic).

(i) Canister—300±25 ml., cylindrical container having a length to diameter ratio of 1.4±0.1. An inlet tube, 5/16 inch ID and 1 inch long, is sealed into the top of the canister at its geometric center. A similar outlet tube is sealed into the wall ¼ inch from the bottom of the canister. The canister is designed to withstand an air pressure of 2 p.s.i., when sealed, without evidence of leaking when immersed in water for 30 seconds.

(ii) Activated carbon—meeting the following specifications:

| | |
|---|---|
| Surface area, min. ($N_2$ BET method).[1] | 1,000 square meters per gram. |
| Adsorption capacity, min. (carbon tetrachloride). | 60 percent, by weight. |
| Volatile material including adsorbed water vapor. | None. |

| Screen analysis size: | *Percent* |
|---|---|
| Less than 1.4 mm | 0 |
| 1.7–2.4 mm | 90–100 |
| More than 3.0 mm | 0 |

[1] Brunauer, Emmett & Teller; Journal of the American Chemical Society; Vol. 60, p. 309, 1938.

The activated carbon trap is prepared for the test by attaching clamped sections of vinyl tubing to the inlet and outlet tubes of the canister. The canister is then filled with 150±10 gm. hot activated carbon which had previously been oven-dried for 3 hours at 300° F. Loss of carbon through the inlet and outlet tubes is prevented through the use of wire screens of 0.7 mm. mesh or wads of loosely packed glass wool. The canister is closed immediately after filling and the carbon is allowed to cool while the trap is vented through a drying tube via the unclamped outlet arm.

(iii) The trap is sealed and weighed after cooling and the weight, to the nearest 0.1 gram, is inscribed on the canister body. Within 12 hours of the scheduled test, the weight of the trap is checked and if it has changed by more than 0.5 gm., it is redried to constant weight. This redrying operation is performed by passing dry nitrogen, heated to 275° F., through the trap, via the inlet tube, at a rate of 1 liter per minute until checks made at 30-minute intervals do not vary by more than 0.1 percent of the gross weight. The trap and its contents are allowed to cool to room temperature, while vented through a drying tube via the outlet arm, before use.

(2) *Auxiliary collection equipment.* (i) Drying tube—transparent, tubular body ¾ inch ID, 6 inches long, with serrated tips and removable caps.

(ii) Desiccant—indicating variety, 8 mesh. The drying tube is attached to the outlet tube of the collection traps to prevent ambient moisture from entering the trap. It is prepared by filling the empty drying tube with fresh desiccant using loose wad of glass wool to hold the desiccant in place. The desiccant is renewed when three-quarters spent, as indicated by color change.

(iii) Collection tubing—stainless steel or aluminum, 5/16 inch ID, for connecting the collection traps to the fuel system vents.

(iv) Polyvinyl chloride (vinyl) tubing—flexible tubing, 5/16 inch ID, for sealing butt-to-butt joints.

(v) Laboratory tubing—airtight flexible tubing 5/16 inch ID, attached to the outlet end of the drying tubes to equalize collection system pressure.

(vi) Clamps—hosecock, open side, for pinching off flexible tubing.

(c) *Weighing equipment.* The balance and weights used shall be capable of determining the net weight of the activated carbon trap within an accuracy of ±75 mg.

(d) *Temperature measuring equipment.* (1) Temperature recorder—multichannel, variable speed, potentiometric, or substantially equivalent recorder with a temperature range of 50° F. to 100° F. and capable of either simultaneous or sequential recording of the ambient air and fuel temperatures within an accuracy of ±1° F.

(2) Fuel tank thermocouples—iron-constantan (type J) construction.

(3) Other types of temperature sensing systems may be provided by the manufacturer if they record the information specified in subparagraph (1) of this paragraph with the required accuracy and if they are self-contained. Type J thermocouples are required for compatability with recording instruments used in Federal certification facilities.

(e) *Assembly and use of the activated carbon vapor collection system.* (1) The prepared activated carbon trap, dried to constant weight, cooled to the ambient temperature and sealed with clamped sections of vinyl tubing is carefully weighed to the nearest 20 milligrams and the weight recorded as the "tare weight."

(2) A drying tube is attached to the outlet tube and the clamp released, but not removed. A length of flexible tubing, for pressure equalization, is connected to the other end of the drying tube.

(3) The inlet tube of the adsorption trap and external vent(s) of the fuel system will be connected by minimal lengths of stainless steel or aluminum tubing and short sections of vinyl tubing. Butt-to-butt joints shall be made wherever possible and precautions taken against sharp bends in the connection lines, including any manifold systems employed to connect multiple vents to a single trap.

(4) The clamp on the inlet tube of the trap shall be released but not removed. Care shall be exercised to prevent heating the vapor collection trap by radiant or conductive heat from the engine.

(5) Upon completion of the collection sequence, the vinyl tubing sections on each arm of the collection trap shall be clamped tight and the collection system dismantled.

(6) The sealed vapor collection trap shall be weighed carefully to the nearest 20 milligrams. This constitutes the "gross weight," which is appropriately recorded. The difference between the "gross weight" and "tare weight" represents the "net weight" for purposes of calculating the fuel vapor losses.

**§ 85.074–22 Information to be recorded.**

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operator.

(e) Driver or operator.

(f) Vehicle: Make—Vehicle identification number—Model year—Transmission type—Odometer reading—Engine displacement—Engine family—Idle r.p.m.—Fuel system—(fuel injection, nominal fuel tank capacity, fuel tank location, number of carburetors, number of carburetor barrels)—Inertia loading—Estimated curb weight—Actual road load horsepower at 50 m.p.h. and drive wheel tire pressure.

(g) Dynamometer serial number and indicated road load power absorption at 50 m.p.h.

(h) All pertinent instrument information such as tuning—gain—serial number—detector number—range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder charts: Identify zero, span, exhaust gas, and dilution air sample traces.

(j) Test cell barometric pressure, ambient temperature, and humidity.

(k) Fuel temperatures, as prescribed.

(l) Pressure of the mixture of exhaust and dilution air entering the positive displacement pump, the pressure increase across the pump, and the temperature set point of the temperature control system. The sample temperature at the inlet to the pump may be measured, if desired, to verify that the temperature variations are within 5° F. of the set point.

(m) The number of revolutions of the positive displacement pump accumulated while the test is in progress and exhaust flow samples are being collected.

**§ 85.074–23 Analytical system calibration and sample handling.**

(a) Calibrate the analytical assembly at least once every 30 days. Use the same flow rate as when analyzing samples.

(1) Adjust analyzers to optimize performance.

(2) Zero the hydrocarbon analyzer with zero grade air and the carbon monoxide and oxides of nitrogen analyzers with either zero grade air or nitrogen. The allowable zero gas impurity concentrations should not exceed 6 p.p.m. equivalent carbon response, 10 p.p.m. carbon monoxide and 1 p.p.m. nitric oxide.

(3) Set the CO and $CO_2$ analyzer gains to give the desired range. Select the desired attenuation scale of the HC analyzer, set the capillary flow rate by adjusting the back pressure regulator, and adjust the electronic gain control, if provided, to give the desired range. Select the desired scale of the $NO_x$ analyzer and adjust the phototube high voltage supply or amplifier gain to give the desired range.

(4) Calibrate the HC analyzer with propane (air diluent) gases having nominal concentrations of 50 and 100 percent of full scale. Calibrate the CO analyzer with carbon monoxide (nitrogen diluent) gases having nominal concentrations equal to 10, 25, 40, 50, 60, 70, 85, and 100 percent of full scale. Calibrate the $NO_x$ analyzer with nitric oxide (nitrogen diluent) gases having nominal concentrations equal to 50 and 100 percent of full scale. The actual concentrations should be known to within ±2 percent of the true values.

(5) Compare values obtained on the CO analyzer with previous calibration curves. Any significant change reflects some problem in the system. Locate and correct problem, and recalibrate. Use best judgment in selecting curves for data reduction.

(6) $NO_x$ Converter Efficiency Determination: The apparatus described and illustrated in Figure A 74–7 is to be used to determine the conversion efficiency of devices that convert $NO_x$ to NO.

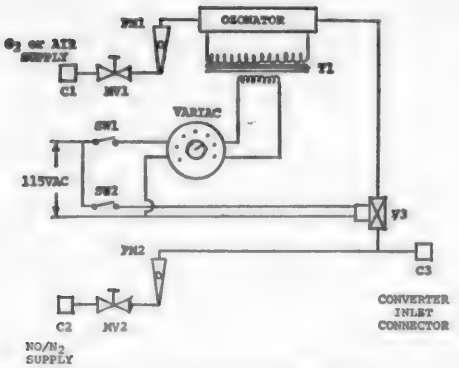



FIGURE A74-7.—$NO_x$ Converter Efficiency Detector.

The following procedure is to be used for determining the values to be used in Equation (A).

(i) Attach the NO/$N_2$ supply (150–250 p.p.m.) at C2, the $O_2$ supply at C1 and the analyzer inlet connection to the efficiency detector at C3. If lower concentrations of NO are used, air may be used in place of $O_2$ to facilitate better control of the $NO_2$ generated during step (iv).

(ii) With the efficiency detector variac off, place the $NO_x$ converter in bypass mode and close valve V3. Open valve MV2 until sufficient flow and stable readings are obtained at the analyzer. Zero and span the analyzer output to indicate the value of the NO concentration being used. Record this concentration.

(iii) Open valve V3 (on/off flow control solenoid valve for $O_2$) and adjust valve MV1 ($O_2$ supply metering valve) to blend enough $O_2$ to lower the NO concentration (ii) about 10 percent. Record this concentration.

(iv) Turn on the ozonator and increase its supply voltage until the NO concentration of (iii) is reduced to about 20 percent of (ii). $NO_2$ is now being formed from the NO+$O_3$ reaction. There must always be at least 10 percent unreacted NO at this point. Record this concentration.

(v) When a stable reading has been obtained from (iv), place the $NO_x$ converter in the convert mode. The analyzer will now indicate the total $NO_x$ concentration. Record this concentration.

(vi) Turn off the ozonator and allow the analyzer reading to stabilize. The mixture NO+$O_2$ is still passing through the converter. This reading is the total $NO_x$ concentration of the dilute NO span gas used at step (iii). Record this concentration.

(vii) Close valve V3. The NO concentration should be equal to or greater than the reading of (ii) indicating whether the NO contains any $NO_2$.

Calculate the efficiency of the $NO_x$ converter by substituting the concentrations obtained during the test into Equation (A).

$$\% \text{ Eff.} = \frac{(v)-(iv)}{(vi)-(iv)} \times 100 \text{ percent}$$

The efficiency of the converter should be greater than 90 percent. Adjusting the converter temperature may be needed to maximize the efficiency. Efficiency checks should be made on each analyzer range using an NO span gas concentration appropriate to the instrument range.

(b) HC, CO, and $NO_x$ measurements: Allow a minimum of 20 minutes warmup for the HC analyzer and 2 hours for the CO and $NO_x$ analyzers. (Power is normally left on infrared and chemiluminescence analyzers; but when not in use, the chopper motor of the infrared analyzer is turned off and the phototube high voltage supply of the chemiluminescence analyzer is placed in the standby position.) The following sequence of operations should be performed in conjunction with each series of measurements:

(1) Zero the analyzers. Obtain a stable zero on each amplifier meter and recorder. Recheck after test.

(2) Introduce span gases and set the CO analyzer gain, the HC analyzer sample capillary flow rate and the $NO_x$ analyzer high voltage supply or amplifier gain to match the calibration curves. In order to avoid corrections, span and calibrate at the same flow rates used to analyze the test samples. Span gases should have concentrations equal to approximately 80 percent of full scale. If gain has shifted significantly on the CO analyzer, check tuning. If necessary, check calibration. Recheck after test. Show actual concentrations on chart.

(3) Check zeroes; repeat the procedure in subparagraphs (1) and (2) of this paragraph if required.

(4) Check flow rates and pressures.

(5) Measure HC, CO, and $NO_x$ concentrations of samples. Prevent moisture from condensing in the sample collection bag.

(6) Check zero and span points.

(c) For the purposes of this paragraph, the term "zero grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

### § 85.074–24 Dynamometer test runs.

(a) The vehicle shall be allowed to stand with engine turned off for a period of not less than 12 hours before the exhaust emission test, at an ambient temperature as specified in §§ 85.074–12 and 85.074–13. The vehicle shall be stored prior to the emission tests in such a manner that precipitation (e.g., rain or dew) does not occur on the vehicle. During the run the ambient temperature shall be between 68° F. and 86° F. For exhaust emission testing which is unrelated to fuel evaporative emission control, the ambient temperature requirement during storage shall be between 60° F. and 86° F.

(b) The following steps shall be taken for each test:

(1) Place drive wheels of vehicle on dynamometer without starting engine.

(2) Start the cooling fan with the vehicle engine compartment cover open.

(3) With the sample solenoid valves in the "dump" position, connect evacuated sample collection bags to the dilute exhaust sample and the dilution air sample line connectors.

(4) Start the positive displacement pump (if not already on), the sample pumps and the temperature recorder. (The heat exchanger of the constant volume sampler should be preheated to its operating temperature before the test begins.)

(5) Adjust the sample flow rates to the desired flow rate (minimum of 5 c.f.h.).

(6) Attach the flexible exhaust tube to the vehicle tailpipe(s).

(7) Simultaneously start the revolution counter for the positive displacement pump, position the sample solenoid valves to direct the sample flows into the bags, and start cranking the engine.

(8) Fifteen seconds after the engine starts, place the transmission in gear.

(9) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(10) Operate the vehicle according to the dynamometer driving schedule. (§ 85.074–14.)

(11) Five seconds after the last deceleration, simultaneously turn off the revolution counter and position the sample solenoid valve to the "dump" position.

(12) Immediately after the end of the sample period turn off the cooling fan and close the engine compartment cover.

(13) Immediately disconnect sample bags, transfer to analytical system and process samples according to § 85.074–23 as soon as practicable, and in no case longer than 10 minutes after the dynamometer run.

(14) Disconnect the exhaust tube from the vehicle tailpipe(s) and remove vehicle from dynamometer.

(15) The positive displacement pump may be turned off, if desired.

### § 85.074–25 Chart reading.

(a) Determine the HC, CO, and $NO_x$ concentrations of the dilution air and dilute exhaust sample bags from the instrument deflection or recordings making use of appropriate calibration charts.

(b) Determine the average dilute exhaust mixture temperature from the

temperature recorder trace if a recorder is used.

**§ 85.074–26 Calculations (exhaust emissions).**

The final reported test results shall be computed by use of the following formulae:

(a) For light duty vehicles, excluding off-road utility vehicles:

(1) Hydrocarbon mass:

$$HC_{mass}=V_{mix}\times Density_{HC}\times\frac{HC_{conc}}{1{,}000{,}000}$$

(2) Carbon monoxide mass:

$$CO_{mass}=V_{mix}\times Density_{co}\times\frac{CO_{conc}}{100}$$

(3) Oxides of nitrogen mass:

$$NO_{x_{mass}}=V_{mix}\times Density_{NO_2}\times\frac{NO_{x_{conc}}}{1{,}000{,}000}\times K_H$$

(b) For off-road utility vehicles:

(1)

$$HC_{mass}=V_{mix}\times Density_{HC}\times\frac{HC_{conc}}{1{,}000{,}000}\times 0.85$$

(2)

$$CO_{mass}=V_{mix}\times Density_{CO}\times\frac{CO_{conc}}{100}\times 0.85$$

(3)

$$NO_{x_{mass}}=V_{mix}\times Density_{NO2}\times\frac{NO_{x_{conc}}}{1{,}000{,}000}\times 0.85\times K_H$$

(c) Meaning of symbols:

$HC_{mass}$ = Hydrocarbon emissions, in grams per vehicle mile.

$Density_{HC}$ = Density of hydrocarbons in the exhaust gas, assuming an average carbon to hydrogen ratio of 1:1.85, in grams per cubic foot at 68° F. and 760 mm. Hg pressure (16.33 gm./cu. ft.).

$HC_{conc}$ = Hydrocarbon concentration of the dilute exhaust sample minus hydrocarbon concentration of the dilution air sample in p.p.m. carbon equivalent i.e. equivalent propane × 3.

$CO_{mass}$ = Carbon monoxide emissions, in grams per vehicle mile.

$Density_{CO}$ = Density of carbon monoxide in grams per cubic foot at 68° F. and 760 mm. Hg pressure (32.97 gm./cu. ft.).

$CO_{conc}$ = Carbon monoxide concentration of the dilute exhaust sample minus the carbon monoxide concentration of the dilution air sample, in volume present.

$NO_{x_{mass}}$ = Oxides of nitrogen emissions in grams per vehicle mile.

$Density_{NO2}$ = Density of oxides of nitrogen in the exhaust gas assuming they are in the form of nitrogen oxide, in grams per cubic foot at 68° F. and 760 mm. Hg pressure (54.16 gm./cu. ft.).

$NO_{x_{conc}}$ = Oxides of nitrogen concentration of the dilute exhaust sample minus the oxides of nitrogen concentration of the dilution air sample, in p.p.m.

$V_{mix}$ = Total dilute exhaust volume in cubic feet per mile, corrected to standard conditions (528° R and 760 mm. Hg).

$$V_{mix}=K_1\times V_o\times N\times\frac{P_B-P_i}{T_p}$$

where:

$$K_1=\frac{528°\ R}{760\ mm.\ Hg\times 7.5\ miles}=0.09263.$$

$V_o$ = Volume of gas pumped by the positive displacement pump, in cubic feet per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

$N$ = Number of revolutions of the positive displacement pump during the test while samples are being collected.

$P_B$ = Barometric pressure in mm. Hg.

$P_i$ = Pressure depression below atmosphere measured at the inlet to the positive displacement pump.

$T_p$ = Average temperature of dilute exhaust entering positive displacement pump during test while samples are being collected, in degrees Rankine.

$K_H$ = Humidity correction factor.

$$K_H=\frac{1}{1-0.0047\ (H-75)}$$

where:

$H$ = Absolute humidity in grains of water per pound of dry air.

$$H=\frac{(43.478)\ R_a\times P_d}{P_B-(P_d\times R_a/100)}$$

$R_a$ = Relative humidity of the ambient air, in percent.

$P_d$ = Saturated vapor pressure, in mm. Hg at the ambient dry bulb temperature.

(d) Example calculation of mass emissions values:

Assume $V_o$=0.265 cu. ft. per revolution; $N$=20,250 revolutions; $R_a$ 66%; $P_B$=754 mm. Hg; $P_d$=22.225 mm. Hg; $P_i$=24 mm.; Hg; $T_p$=550°R; $HC_{conc}$=160 p.p.m. carbon equivalent; $CO_{conc}$=0.09%; and $NO_{x_{conc}}$=70 p.p.m.

Then:

$$V_{mix}=(0.09263)\ (0.265)\ (20{,}250)\ \frac{(754-24)}{(550)}$$

$$=659.8\ \text{cu. ft. per mile}$$

$$H=\frac{(43.478)\ (65)\ (22.225)}{754-(22.225\times 65/100)}=85\ \text{grains per pound of dry air.}$$

$$K_H=\frac{1}{1-0.0047\ (85-75)}=1.049.$$

(1) For a 1974 light duty vehicle.

$$HC_{mass}=659.8\times 16.33\times\frac{160}{1{,}000{,}000}$$

$$=1.72\ \text{grams per vehicle mile}$$

$$NO_{x_{mass}}=659.8\times 54.16\times\frac{70}{1{,}000{,}000}\times 1.049$$

$$=2.62\ \text{grams per vehicle mile}$$

(2) For a 1974 off-road utility vehicle.

$$CO_{mass}=659.8\times 32.97\times\frac{0.09\times 0.85}{100}$$

$$=16.6\ \text{grams per vehicle mile.}$$

**§ 85.074–27 Calculations (fuel evaporative emissions).**

The net weights of the individual collection traps employed in § 85.074–13 shall be added together to determine compliance with the fuel evaporative emission standard.

**§ 85.074–28 Compliance with emission standards.**

(a) The exhaust and fuel evaporative emission standards in § 85.074–1 apply to the emissions of vehicles for their useful life.

(b) Since emission control efficiency decreases with mileage accumulated on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as the basis for determining compliance with the standards.

(c) The procedure for determining compliance of a new light duty motor vehicle with exhaust and fuel evaporative emission standards is as follows:

(1) Separate emission deterioration factors shall be determined from the emission results of the durability vehicle for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust CO, exhaust $NO_x$, and fuel evaporative HC.

(i) The applicable results to be used in determining the deterioration factors for each combination shall be:

(*a*) All valid emission data from the tests required under § 85.074–7(b), except the 0-mile tests. This shall include the official test results, as determined in § 85.074–29, for all tests conducted on all durability vehicles of the combination selected under § 85.074–5(c) (including all vehicles elected to be operated by the manufacturer under § 85.074–5(c)(3)).

(*b*) All valid emission data from the tests conducted before and after the maintenance provided in § 85.074–6(a)(1)(i).

(*c*) All emission data from tests required by maintenance approved under § 85.074–6(a)(1)(ix), in those cases where the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(ii) All applicable results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The interpolated 4,000- and 50,000-mile points on this line must be within the standards provided in § 85.074–1 or the data will not be acceptable for use in calculation of a deterioration factor, unless no applicable data point exceeded the standard.

(iii) An exhaust emission deterioration factor shall be calculated for each combination as follows:

$$\text{factor}=\frac{\text{exhaust emissions interpolated to 50,000 miles}}{\text{exhaust emissions interpolated to 4,000 miles}}$$

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29–67.

(iv) An evaporative emission deterioration factor shall be calculated for each combination by subtracting the evaporative emissions interpolated to 4,000 miles from the evaporative emissions interpolated to 50,000 miles. These interpolated values shall be carried out, in accordance with ASTM E 29–67, to a minimum of three decimal places to the right of the decimal point before subtracting one from the other to determine the deterioration factor.

(2) (i) The exhaust emission test results for each emission data vehicle shall be multiplied by the appropriate deterioration factor: *Provided,* That if a deterioration factor as computed in paragraph (c)(1)(iii) of this paragraph is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(ii) The evaporative emission test results for each combination shall be adjusted by addition of the appropriate deterioration factor: *Provided,* That if a deterioration factor as computed in paragraph (c)(1)(iv) of this section is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(3) The emissions to compare with the standard shall be the adjusted emissions

of paragraph (c)(2) (i) and (ii) for each emission data vehicle. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29-67, to two significant figures. The rounded emission values may not exceed the standard.

(4) Every test vehicle of an engine family must comply with all applicable standards, as determined in paragraph (c)(3), before any vehicle in that family may be certified.

**§ 85.074-29 Testing by the Administrator.**

(a) The Administrator may require that any one or more of the test vehicles be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(b) (1) Whenever the Administrator conducts a test on a test vehicle, the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the vehicle at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(2) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided*, That if the Administrator makes a determination based on testing under paragraph (a) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer.

(3) (i) The emission data vehicle presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the vehicle label (see § 85.074-35(a)(4)(iv)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the vehicle shall be used as an emission data vehicle.

(ii) If the Administrator determines that the test data developed under paragraph (b)(3)(i) would cause the emission data vehicle to fail due to excessive 4,000 mile emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(*a*) The manufacturer may request a retest. Before the retest, the vehicle may be readjusted to manufacturer's specifications, if these adjustments were made incorrectly prior to the first test, and other maintenance or repairs may be performed in accordance with § 85.074-6. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*b*) The vehicle will be retested by the Administrator and the results of this test shall comprise the official data for the emission data vehicle.

(4) If sufficient durability data are not available at the time of any emission test conducted under paragraph (a) of this section, to enable the Administrator to determine whether an emission data vehicle would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (c)(3)(i) (*a*) and (*b*). If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the vehicle from the test premises.

**§ 85.074-30 Certification.**

(a) (1) If, after a review of the test reports and data submitted by the manufacturer and data derived from any additional testing conducted pursuant to § 85.074-29, the Administrator determines that a test vehicle(s) conforms to the regulations of this subpart, he will issue a certificate of conformity with respect to such vehicle(s).

(2) Such certificate will be issued for such period not more than 1 model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motor vehicle covered by the certificate will meet the requirements of the Act and this subpart.

(b) (1) The Administrator will determine whether a vehicle covered by the application complies with applicable standards by observing the following relationships:

(i) A test vehicle selected under § 85.074-5(b)(2) or (4) shall represent all vehicles in the same engine family of the same engine displacement-exhaust emission control system-evaporative emission control system combination.

(ii) A test vehicle selected under § 85.074-5(b)(3) shall represent all vehicles the same in the same engine family of the same engine displacement-exhaust emission control system-transmission type-fuel system combination.

(iii) A test vehicle selected under § 85.074-5(c)(1) shall represent all vehicles of the same engine-system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles belonging to an engine family all of which comply with applicable standards.

(3) If, after a review of the test reports and data submitted by the manufacturer and data derived from any additional testing conducted pursuant to § 85.074-29, the Administrator determines that one or more test vehicles of the certification test fleet do not meet applicable standards, he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination, and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 85.005 with respect to such issue.

(4) The manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test vehicle(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 85.005, or

(ii) Delete from the application for certification the vehicles represented by the failing test vehicle. (Vehicles so deleted may be included in a later request for certification under § 85.074-32.) The Administrator will then select in place of each failing vehicle an alternate vehicle chosen in accordance with selection criteria employed in selecting the vehicle that failed, or

(iii) Modify the test vehicle and demonstrate by testing that it meets applicable standards. Another vehicle which is in all material respects the same as the first vehicle, as modified, shall then be operated and tested in accordance with applicable test procedures.

(5) If the manufacturer does not request a hearing or present the required data under subparagraph (4) of this paragraph, the Administrator will deny certification.

**§ 85.074-31 Separate certification.**

Where possible a manufacturer should include in a single application for certification all vehicles for which certification is required. A manufacturer may, however, choose to apply separately for certification of part of his product line. The selection of test vehicles and the computation of test results will be determined separately for each application.

**§ 85.074-32 Addition of a vehicle after certification.**

(a) If a manufacturer proposes to add to his product line a vehicle of the same engine-system combination as vehicles previously certified but which was not described in the application for certification when the test vehicle(s) representing other vehicles of that combination

was certified, he shall notify the Administrator. Such notification shall be in advance of the addition unless the manufacturer elects to follow the procedure described in § 85.074–34. This notification shall include a full description of the vehicle to be added.

(b) The Administrator may require the manufacturer to perform such tests on the test vehicle(s) representing the vehicle to be added which would have been required if the vehicle had been included in the original application for certification.

(c) If, after a review of the test reports and data submitted by the manufacturer, and data derived from any testing conducted under § 85.074–29, the Administrator determines that the test vehicle(s) meets all applicable standards, the appropriate certificate will be amended accordingly. If the Administrator determines that the test vehicle(s) does not meet applicable standards, he will proceed under § 85.074–30(b).

**§ 85.074–33 Changes to a vehicle covered by certification.**

(a) The manufacturer shall notify the Administrator of any change in production vehicles in respect to any of the parameters listed in § 85.074–5(a)(3) or § 85.074–5(b)(3), giving a full description of the change. Such notification shall be in advance of the change unless the manufacturer elects to follow the procedure described in § 85.074–34.

(b) Based upon the description of the change, and data derived from such testing as the Administrator may require or conduct, the Administrator will determine whether the vehicle, as modified, would still be covered by the certificate of conformity then in effect.

(c) If the Administrator determines that the outstanding certificate would cover the modified vehicles, he will notify the manufacturer in writing. Except as provided in § 85.074–34, the change may not be put into effect prior to the manufacturer's receiving this notification. If the Administrator determines that the modified vehicles would not be covered by the certificate then in effect, then the modified vehicles shall be treated as additions to the product line subject to § 85.074–32.

**§ 85.074–34 Alternative procedure for notification of additions and changes.**

(a) A manufacturer may, in lieu of notifying the Administrator in advance of an addition of a vehicle under § 85.074–32 or a change in a vehicle under § 85.074–33, notify him concurrently with the making of the change if the manufacturer believes the addition or change will not require any testing under the appropriate section. Upon notification to the Administrator, the manufacturer may proceed to put the addition or change into effect.

(b) The manufacturer may continue to produce vehicles as described in the notification to the Administrator for a maximum of 30 days, unless the Administrator grants an extension in writing. This period may be shortened by a notification in accordance with paragraph (c) of this section.

(c) If the Administrator determines, based upon a description of the addition or change, that no test data will be required, he will notify the manufacturer in writing of the acceptability of the addition or change. If the Administrator determines that test data will be required, he will notify the manufacturer to rescind the change within 5 days of receipt of the notification. The Administrator will then proceed as in § 85.074–32 (b) and (c), or § 85.074–33 (b) and (c) as appropriate.

(d) Election to produce vehicles under this section will be deemed to be a consent to recall all vehicles which the Administrator determines under § 85.074–32(c) do not meet applicable standards, and to cause such nonconformity to be remedied at no expense to the owner.

**§ 85.074–35 Labeling.**

(a)(1) The manufacturer of any light duty motor vehicle subject to the standards prescribed in § 85.074–1 shall, at the time of manufacture, affix a permanent, legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles available for sale to the public and covered by a certificate of conformity under § 85.074–30(a).

(2) A plastic or metal label shall be welded, riveted, or otherwise permanently attached in a readily visible position in the engine compartment.

(3) The label shall be affixed by the vehicle manufacturer, who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label, and shall not be affixed to any equipment which is easily detached from such vehicle.

(4) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(i) The label heading: Vehicle Emission Control Information;

(ii) Full corporate name and trademark of manufacturer;

(iii) Engine displacement (in cubic inches) and engine family identification;

(iv) Engine tuneup specifications and adjustments, as recommended by the manufacturer, including idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g. idle CO, idle air-fuel ratio, idle speed drop). These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air-conditioner), if any should be in operation;

(v) The statement: "This Vehicle Conforms to U.S.E.P.A. Regulations Applicable to 1974 Model Year New Motor Vehicles."

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle conforms to any applicable State emission standard for new motor vehicles or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle.

**§ 85.074–36 Submission of vehicle identification numbers.**

(a) The manufacturer of any light duty motor vehicle covered by a certificate of conformity under § 85.074–30(a) shall, not later than 60 days after its manufacture, submit to the Administrator the vehicle identification number of such vehicle: *Provided*, That this requirement shall not apply with respect to any vehicle manufactured within any State, as defined in section 302(d) of the Act.

(b) The requirements of this section may be waived with respect to any manufacturer who provides information satisfactory to the Administrator which will enable the Administrator to identify those vehicles which are covered by a certificate of conformity.

**§ 85.074–37 Production vehicles.**

(a) Any manufacturer obtaining certification under this subpart shall supply to the Administrator, upon his request, a reasonable number of production vehicles selected by the Administrator which are representative of the engines, emission control systems, fuel systems, and transmissions offered and typical of production models available for sale under the certificate. These vehicles shall be supplied for testing at such time and place and for such reasonable periods as the Administrator may require.

(b) Any manufacturer obtaining certification under this subpart shall notify the Administrator, on a quarterly basis, of the number of vehicles of each engine family - engine displacement - exhaust emission control system-fuel system-transmission type-inertia weight class combination produced for sale in the United States during the preceding quarter. A manufacturer may elect to provide this information every 60 days instead of quarterly, to combine it with the notification required under § 85.074–36.

(c) All light duty vehicles covered by a certificate of conformity under § 85.074–30(a) shall be adjusted by the manufacturer to the ignition timing specification detailed in § 85.074–35(a)(4)(iv).

**§ 85.074–38 Maintenance instructions.**

(a) The manufacturer shall furnish or cause to be furnished to the ultimate purchaser of each new motor vehicle subject to the standards prescribed in § 85.074–1, written instructions for the maintenance and use of the vehicle by the ultimate purchaser as may be reasonable and necessary to assure the proper functioning of emission control systems.

(1) Such instructions shall be provided for those vehicle and engine components listed in Appendix VI to this part (and for any other components) to the

extent that maintenance of these components is necessary to assure the proper functioning of emission control systems.

(2) Such instructions shall be in clear, and to the extent practicable, nontechnical language.

(b) The maintenance instructions required by this section shall contain a general description of the documentation which the manufacturer will require from the ultimate purchaser or any subsequent purchaser as evidence of compliance with the instructions.

**§ 85.074–39 Submission of maintenance instructions.**

(a) The manufacturer shall provide to the Administrator, no later than the time of the submission required by § 85.074–4, a copy of the maintenance instructions which the manufacturer proposes to supply to the ultimate purchaser in accordance with § 85.074–38(a). The Administrator will review such instructions to determine whether they are reasonable and necessary to assure the proper functioning of the vehicle's emission control systems. The Administrator will notify the manufacturer of his determination whether such instructions are reasonable and necessary to assure the proper functioning of the emission control systems.

(b) Any revision to the maintenance instructions which will affect emissions shall be supplied to the Administrator at least 30 days before being supplied to the ultimate purchaser unless the Administrator consents to a lesser period of time.

**§ 85.075–1 Emission standards for 1975 model year vehicles.**

(a) (1) Exhaust emissions from 1975 model year vehicles shall not exceed:

(i) *Hydrocarbons.* 0.41 gram per vehicle mile.

(ii) *Carbon monoxide.* 3.4 grams per vehicle mile.

(iii) *Oxides of nitrogen.* 3.1 grams per vehicle mile.

(2) The standards set forth in paragraph (a)(1) of this section refer to the exhaust emitted over a driving schedule as set forth in § 85.075–9 through § 85.075–27 and measured and calculated in accordance with those procedures.

(b) (1) Fuel evaporative emissions shall not exceed:

(i) *Hydrocarbons*—2.0 grams per test.

(2) The standard set forth in paragraph (b)(1) of this section refers to a composite sample of the fuel evaporative emissions collected under the conditions set forth in § 85.075–9 through § 85.075–27 and measured in accordance with those procedures.

(c) No crankcase emissions shall be discharged into the ambient atmosphere from any new motor vehicle subject to this subpart.

**§ 85.075–2 Application for certification.**

(a) An application for a certificate of conformity to the regulations applicable to any new motor vehicle shall be made to the Administrator by the manufacturer and shall be kept current and accurate by amendment.

(b) The application shall be in writing, signed by an authorized representative of the manufacturer, and shall include the following:

(1) Identification and description of the vehicles covered by the application and a description of their emission control systems.

(2) Projected U.S. sales data sufficient to enable the Administrator to select a test fleet representative of the vehicles for which certification is requested.

(3) A description of the test equipment and fuel proposed to be used.

(4) A description of the proposed mileage accumulation procedure for durability testing.

(5) A statement of recommended maintenance and procedures necessary to assure that the vehicles covered by a certificate of conformity in operation conform to the regulations, and a description of the program for training of personnel for such maintenance, and the equipment required.

(6) At the option of the manufacturer, the proposed composition of the emission data and durability data test fleet.

**§ 85.075–3 Approval of procedure and equipment; test fleet selections.**

Based upon the information provided in the application for certification, and any other information the Administrator may require, the Administrator will approve or disapprove in whole or in part the mileage accumulation procedure and equipment and fuel proposed by the manufacturer, and notify him in writing of such determination. Where any part of a proposal is disapproved, such notification will specify the reasons for disapproval. The Administrator will select a test fleet in accordance with § 85.075–5.

**§ 85.075–4 Required data.**

The manufacturer shall perform the tests required by the applicable test procedures, and submit to the Administrator the following information:

(a) Durability data on such vehicles tested in accordance with the applicable test procedures of this subpart, and in such numbers as therein specified, which will show the performance of the systems installed on or incorporated in the vehicle for extended mileage, as well as a record of all pertinent maintenance performed on the test vehicles.

(b) Emission data on such vehicles tested in accordance with the applicable emission test procedures of this subpart and in such numbers as therein specified, which will show their emissions after zero miles and 4,000 miles of operation.

(c) A description of tests performed to ascertain compliance with the general standards in § 85.075–1 and the data derived from such tests.

(d) A statement that the test vehicles with respect to which data are submitted have been tested in accordance with the applicable test procedures, that they meet the requirement of such tests, and that, on the basis of such tests, they conform to the requirements of the regulations in this subpart. If such statements cannot be made with respect to any vehicle tested, the vehicle shall be identified, and all pertinent test data relating thereto shall be supplied.

**§ 85.075–5 Test vehicles.**

(a) (1) The vehicles covered by the application for certification will be divided into groupings of vehicles whose engines are expected to have similar emission characteristics. Each group of engines with similar emission characteristics shall be defined as a separate engine family.

(2) To be classed in the same engine family, engines must be identical in all the following respects:

(i) The cylinder bore center-to-center dimensions.

(ii) The dimension from the centerline of the crankshaft to the centerline of the camshaft.

(iii) The dimension from the centerline of the crankshaft to the top of the cylinder block head face.

(iv) The cylinder block configuration (air cooled or water cooled; L–6, 90° V–8, etc.).

(v) The location of intake and exhaust valves and the valve sizes (within a ⅛-inch range on the valve head diameter).

(vi) The method of air aspiration.

(vii) The combustion cycle.

(3) Engines identical in all the respects listed in subparagraph (2) of this paragraph may be further divided into different engine families if the Administrator determines that they may be expected to have different emission characteristics. This determination will be based upon a consideration of the following features of each engine:

(i) The bore and stroke.

(ii) The surface-to-volume ratio of the nominally dimensioned cylinder at the top dead center position.

(iii) The intake manifold induction port size and configuration.

(iv) The exhaust manifold port size and configuration.

(v) The intake and exhaust valve sizes.

(vi) The fuel system.

(vii) The camshaft timing and ignition timing characteristics.

(4) Where engines are of a type which cannot be divided into engine families based upon the criteria listed in subparagraphs (2) and (3) of this paragraph, the Administrator will establish families for those engines based upon the features most related to their emission characteristics.

(b) Emission data vehicles:

(1) Vehicles will be chosen to be operated and tested for emission data based upon the engine family groupings. Within each engine family, the requirements of this paragraph must be met.

(2) Vehicles of each engine family will be divided into engine displacement-exhaust emission control system-evaporative emission control system combinations. A projected sales volume will be established for each combination for the 1975 model year. One vehicle of each combination will be selected in order of decreasing projected sales volume until 70 percent of the projected sales of a

manufacturer's total production of vehicles of that engine family is represented, or until a maximum of four vehicles is selected. If any single combination represents over 70 percent, then two vehicles of that combination may be selected. The vehicle selected for each combination will be specified by the Administrator as to transmission type, fuel system, and inertia weight class.

(3) The Administrator may select a maximum of four additional vehicles within each engine family based upon features indicating that they may have the highest emission levels of the vehicles in that engine family. In selecting these vehicles, the Administrator will consider such features as the emission control system combination, induction system characteristics, ignition system characteristics, fuel system, rated horsepower, rated torque, compression ratio, inertia weight class, transmission options, and axle ratios.

(4) If the vehicles selected in accordance with subparagraphs (2) and (3) of this paragraph do not represent each engine-system combination, then one vehicle of each engine-system combination not represented will be selected by the Administrator. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with the control system combination in the engine family and will be designated by the Administrator as to transmission type, fuel system, and inertia weight class.

(c) Durability data vehicles:

(1) A durability data vehicle will be selected by the Administrator to represent each engine-system combination. The vehicle selected shall be of the engine displacement with the largest projected sales volume of vehicles with that control-system combination in that engine family and will be designated by the Administrator as to transmission type, fuel system, and inertia weight class.

(2) A manufacturer may elect to operate and test additional vehicles to represent any engine-system combination. The additional vehicles must be of the same engine displacement, transmission type, fuel system, and inertia weight class as the vehicle selected for that engine-system combination in accordance with the provisions of subparagraph (1) of this paragraph. Notice of an intent to operate and test additional vehicles shall be given to the Administrator not later than 30 days following notification of the test fleet selection.

(d) For purposes of testing under § 85.073–7(g), the Administrator may require additional emission data vehicles and durability data vehicles identical in all material respects to vehicles selected in accordance with paragraphs (b) and (c) of this section: *Provided*, That the number of vehicles selected shall not increase the size of either the emission data fleet or the durability data fleet by more than 20 percent or one vehicle, whichever is greater.

(e) Any manufacturer whose projected sales of new motor vehicles subject to this subpart for the 1975 model year is less than 2,000 vehicles may request a reduction in the number of test vehicles determined in accordance with the foregoing provisions of this section. The Administrator may agree to such lesser number as he determines would meet the objectives of this procedure.

(f) In lieu of testing an emission data or durability data vehicle selected under paragraph (b) or (c) of this section, and submitting data therefor, a manufacturer may, with the prior written approval of the Administrator, submit data on a similar vehicle for which certification has previously been obtained.

(g) (1) Where it is expected that more than 33 percent of an engine family will be equipped with an optional item, the full estimated weight of that item shall be included, if required by the Administrator, in the curb weight computation for each vehicle available with that option in the engine family. Where it is expected that 33 percent or less of the vehicles in an engine family will be equipped with an item of optional equipment, no weight for that item will be added in computing curb weight. In the case of mutually exclusive options, only the weight of the heavier option will be added in computing curb weight. Optional equipment weighing less than 3 pounds per item need not be considered.

(2) Where it is expected that more than 33 percent of an engine family may be equipped with an item of optional equipment that can reasonably be expected to influence emissions, then such items of optional equipment shall actually be installed, unless specifically excluded by the Administrator, on all emission data and durability vehicles in the engine family on which the option is intended to be offered in production. Optional equipment that can reasonably be expected to influence emissions are the air conditioner, power steering, power brakes and other items determined by the Administrator.

(3) Optional equipment that can reasonably be expected to influence emissions which is utilized on 33 percent or less of the vehicles in the engine family shall not be installed on any vehicle in that engine family unless specifically required under this section.

**§ 85.075–6 Maintenance.**

(a) (1) Scheduled maintenance on the engine, emission control system, and fuel system of durability vehicles shall be scheduled for performance during durability testing at the same mileage intervals that will be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle. Such maintenance shall be performed, except as provided in paragraph (a) (5) (iii) of this section, only under the following provisions:

(i) Scheduled major engine tuneups to manufacturer's specifications may be performed no more frequently than every 12,500 miles of scheduled driving, provided that no tuneup may be performed after 45,000 miles of scheduled driving. A scheduled major engine tuneup shall be restricted to paragraph (a) (1) (i) (*a*) through (*k*) of this section and shall be conducted in a manner consistent with service instructions and specifications provided by the manufacturer for use by customer service personnel. The following items may be inspected, replaced, cleaned, adjusted, and/or serviced as required:

(*a*) Ignition system.

(*b*) Cold starting enrichment system (includes fast idle speed setting).

(*c*) Curb idle speed and air/fuel mixture.

(*d*) Drive belt tension on engine accessories.

(*e*) Valve lash.

(*f*) Inlet air and exhaust gas control valves.

(*g*) Engine bolt torque.

(*h*) Spark plugs.

(*i*) Fuel filter and air filter.

(*j*) Crankcase emission control system.

(*k*) Fuel evaporative emission control system.

(ii) Change of engine and transmission oil, and change or service of oil filter will be allowed at the same mileage intervals that will be specified in the manufacturer's maintenance instructions.

(iii) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to during scheduled major engine tuneups, once during the first 5,000 miles of vehicle operation.

(2) Unscheduled maintenance on the engine, emission control system, and fuel system of durability vehicles may be performed, except as provided in paragraph (a) (5) (i) of this section, only under the following provisions:

(i) Any persistently misfiring spark plug may be replaced, in addition to replacement at scheduled major engine tuneup points.

(ii) Readjustment of the engine cold starting enrichment system may be performed if there is a problem of stalling or if there is visible black smoke.

(iii) Readjustment of the engine idle speed (curb idle and fast idle) may be performed, in addition to that performed as scheduled maintenance under paragraph (a) (1) of this section, if the idle speed exceeds the manufacturer's recommended idle speed by 300 R.p.m. or more, or if there is a problem of stalling.

(iv) The idle mixture may be reset, other than during scheduled major engine tuneups, only with the advance approval of the Administrator.

(3) An exhaust gas recirculation (EGR) system may be serviced during durability testing only under one of the following provisions:

(i) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneups if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for EGR system maintenance at each of those mileage points. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and

if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(ii) Manufacturers may service the EGR system as unscheduled maintenance a maximum of three times during the 50,000 miles if failure of the EGR system activates an audible and/or visual signal approved by the Administrator which alerts the vehicle operator to the need for EGR system maintenance. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(iii) Manufacturers may service the EGR system a maximum of three times during the 50,000 miles either at a scheduled major engine tuneup point or as unscheduled maintenance, if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for EGR system maintenance. The signal may be activated either by EGR system failure (unscheduled maintenance) or need for scheduled periodic maintenance. If maintenance is performed, the signal for scheduled periodic maintenance shall be reset. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(iv) Manufacturers may schedule service to the EGR system at the scheduled major engine tuneup(s) if failure to perform EGR system maintenance is not likely, as determined by the Administrator, to result in an improvement in vehicle performance. One additional servicing may also be performed as unscheduled maintenance if there is an overt indication of malfunction and if the malfunction or repair of the malfunction does not render the test vehicle unrepresentative of vehicles in use.

(4) The catalytic converter may be serviced once during 50,000 miles if an audible and/or visual signal approved by the Administrator alerts the vehicle operator to the need for maintenance. The signal may be activated either by component failure or need for maintenance at a scheduled point.

(5) Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on durability vehicles shall be performed only with the advance approval of the Administrator.

(i) In the case of unscheduled maintenance, such approval will be given if the Administrator:

(*a*) Has made a preliminary determination that part failure or system malfunction, or the repair of such failure or malfunction, does not render the vehicle unrepresentative of vehicles in use, and does not require direct access to the combustion chamber, except for spark plug, fuel injection component, or removable prechamber removal or replacement; and

(*b*) Has made a determination that the need for maintenance or repairs is indicated by an overt indication of malfunction such as persistent misfire, vehicle stall, overheating, fluid leakage, loss of oil pressure, or charge indicator warning.

(ii) Emission measurements may not be used as a means of determining the need for unscheduled maintenance under paragraph (a)(5)(i)(*a*).

(iii) Requests for authorization of scheduled maintenance of emission control-related components not specifically authorized to be maintained by these regulations must be made prior to the beginning of durability testing. The Administrator will approve the performance of such maintenance if the manufacturer makes a satisfactory showing that the maintenance will be performed on vehicles in use.

(6) If the Administrator determines that part failure or system malfunction occurrence and/or repair rendered the vehicle unrepresentative of vehicles in use, the vehicle shall not be used as a durability vehicle.

(7) Where the Administrator agrees under § 85.075–7 to a mileage accumulation of less than 50,000 miles for durability testing, he may modify the requirements of this paragraph.

(b) Adjustment of engine idle speed on emission data vehicles may be performed once before the 4,000 mile test point. Any other engine, emission control system, or fuel system adjustment, repair, removal, disassembly, cleaning, or replacement on emission data vehicles shall be performed only with the advance approval of the Administrator.

(c) Repairs to vehicle components of the durability or emission data vehicle, other than the engine, emission control system, or fuel system, shall be performed only as a result of part failure, vehicle system malfunction, or with the advance approval of the Administrator.

(d) Complete emission tests (see §§ 85.075–10 and 85.075–27) are required, unless waived by the Administrator, before and after any vehicle maintenance which may reasonably be expected to affect emissions. These test data shall be air posted to the Administrator within 24 hours (or delivered within 3 working days), after the tests, along with a complete record of all pertinent maintenance, including a preliminary engineering report of any malfunction diagnosis and the corrective action taken. A complete engineering report shall be delivered or air posted to the Administrator within 10 working days after the tests. In addition, all test data and maintenance reports shall be compiled and provided to the Administrator in accordance with § 85.075–4.

(e) The Administrator shall be given the opportunity to verify the existence of an overt indication of part failure and/or vehicle malfunction (e.g., misfire, stall, black smoke), or an activation of an audible and/or visual signal, prior to the performance of any maintenance to which such overt indication or signal is relevant under the provisions of this section.

(f) Equipment, instruments, or tools may not be used to identify malfunctioning, maladjusted, or defective engine components unless the same or equivalent equipment, instruments, or tools will be available to dealerships and other service outlets and

(1) Are used in conjunction with scheduled maintenance on such components,

(2) Are used subsequent to the identification of a vehicle or engine malfunction, as provided in paragraph (a)(5)(i) of this section for durability vehicles or paragraph (b) of this section for emission data vehicles, or

(3) Unless specifically authorized by the Administrator.

### § 85.075–7 Mileage accumulation and emission standards.

The procedure for mileage accumulation will be the Durability Driving Schedule as specified in Appendix IV to this part. A modified procedure may also be used if approved in advance by the Administrator. Except with the advance approval of the Administrator, all vehicles will accumulate mileage at a measured curb weight which is within 100 pounds of the estimated curb weight. If the loaded vehicle weight is within 100 pounds of being included in the next higher inertia weight class as specified in § 85.075–15(d), the manufacturer may elect to conduct the respective emission tests at the inertia weight corresponding to the higher loaded vehicle weight.

(a) Emission data vehicles: Each emission data vehicle shall be driven 4,000 miles with all emission control systems installed and operating. Emission tests shall be conducted at zero miles and 4,000 miles.

(b) Durability data vehicles: Each durability vehicle shall be driven, with all emission control systems installed and operating, for 50,000 miles or such lesser distance as the Administrator may agree to as meeting the objectives of this procedure. Complete emission tests (see §§ 85.075–10 through 85.075–27) shall be made at the following mileage points: 0, 5,000, 10,000, 15,000, 20,000, 25,000, 30,000, 35,000, 40,000, 45,000, and 50,000.

(c) All tests required by this subpart to be conducted after every 5,000 miles of driving for durability vehicles and 4,000 miles for emission data vehicles must be conducted at any accumulated mileage within 250 miles of each of those test points.

(d) (1) The results of each emission test shall be supplied to the Administrator immediately after the test. The manufacturer shall furnish to the Administrator explanation for voiding any test. The Administrator will determine if voiding the test was appropriate based upon the explanation given by the manufacturer for the voided test. If a manufacturer conducts multiple tests at any test point at which the data are intended to be used in the calculation of the deterioration factor, the number of tests must be the same at each point and may not exceed three valid tests. Tests between test points may be conducted as required by the Administrator.

Data from all tests (including voided tests) shall be air posted to the Administrator within 24 hours (or delivered within three working days). In addition, all test data shall be compiled and provided to the Administrator in accordance with § 85.075–4. Where the Administrator conducts a test on a durability vehicle at a prescribed test point, the results of that test will be used in the calculation of the deterioration factor.

(2) The results of all emission tests shall be recorded and reported to the Administrator using three significant figures. These numbers shall be rounded in accordance with the "Rounding Off Method" specified in ASTM E 29–67.

(e) Whenever the manufacturer proposes to operate and test a vehicle which may be used for emission or durability data, he shall provide the zero mile test data to the Administrator and make the vehicle available for such testing under § 85.075–29 as the Administrator may require before beginning to accumulate mileage on the vehicle. Failure to comply with this requirement will invalidate all test data submitted for this vehicle.

(f) Once a manufacturer begins to operate an emission data or durability data vehicle, as indicated by compliance with paragraph (e) of this section, he shall continue to run the vehicle to 4,000 miles or 50,000 miles, respectively, and the data from the vehicle will be used in the calculations under § 85.075–28. Discontinuation of a vehicle shall be allowed only with the written consent of the Administrator.

(g) (1) The Administrator may elect to operate and test any test vehicle during all or any part of the mileage accumulation and testing procedure. In such cases, the manufacturer shall provide the vehicle(s) to the Administrator with all information necessary to conduct this testing.

(2) The test procedures in §§ 85.075–9 through 85.075–27 will be followed by the Administrator. The Administrator will test the vehicles at each test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(3) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other vehicles of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(h) Emission testing of any type with respect to any certification vehicle other than that specified in this subpart is not allowed except as such testing may be specifically authorized by the Administrator.

### § 85.075–8 Special test procedures.

The Administrator may, on the basis of a written application therefor by a manufacturer, prescribe test procedures, other than those set forth in this subpart, for any motor vehicle which he determines is not susceptible to satisfactory testing by the procedures set forth herein.

### § 85.075–9 Test procedures.

The procedures described in this and subsequent sections will be the test program to determine the conformity of vehicles with the standards set forth in § 85.075–1.

(a) The test consists of prescribed sequences of fueling, parking, and operating conditions. The exhaust gases generated during vehicle operation are diluted with air and sampled continuously for subsequent analysis of specific components by prescribed analytical techniques. The fuel evaporative emissions are collected for subsequent weighing during both vehicle parking and operating events. The test applies to vehicles equipped with catalytic or direct-flame afterburners, induction system modifications, or other systems or to uncontrolled vehicles and engines.

(b) The exhaust emission test is designed to determine hydrocarbon, carbon monoxide, and oxides of nitrogen mass emissions while simulating an average trip in an urban area of 7.5 miles. The test consists of engine startups and vehicle operation on a chassis dynamometer through a specified driving schedule, as described in Appendix I to this part. A proportional part of the diluted exhaust emissions is collected continuously, for subsequent analysis, using a constant volume (variable dilution) sampler.

(c) The fuel evaporative emission test is designed to determine fuel hydrocarbon evaporative emissions to the atmosphere as a consequence of urban driving, and diurnal temperature fluctuations during parking. It is associated with a series of events representative of a motor vehicle's operation, which result in fuel vapor losses directly from the fuel tank and carburetor. Activated carbon traps are employed in collecting the vaporized fuel. The test procedure is specifically aimed at collecting and weighing:

(1) Diurnal breathing losses from the fuel tank and other parts of the fuel system when the fuel tank is subjected to a temperature increase representative of the diurnal range;

(2) Running losses from the fuel tank and carburetor resulting from a simulated trip on a chassis dynamometer; and

(3) Hot soak losses from the fuel tank and carburetor which result when the vehicle is parked and the hot engine is turned off.

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 85.075–6.

### § 85.075–10 Gasoline specifications.

(a) Fuel having the following specifications or substantially equivalent specifications approved by the Administrator, shall be used in exhaust and evaporative emission testing. The lead content and octane rating of the fuel shall be in the range recommended by the vehicle or engine manufacturer.

| Item | ASTM designation | Specifications |
|---|---|---|
| Distillation range | D 86 | |
| IBP, °F | | 75–95 |
| 10 percent point, °F | | 120–135 |
| 50 percent point, °F | | 200–230 |
| 90 percent point, °F | | 300–325 |
| EP, °F (max.) | | 415 |
| Sulfur, wt. percent, max | D 1266 | 0.10 |
| Phosphorous, theory | | 0.0 |
| RVP,[1] lb | D 323 | 8.7–9.2 |
| Hydrocarbon composition | D 1319 | |
| Olefins, percent, max | | 10 |
| Aromatics, percent, max | | 35 |
| Saturates | | Remainder |

[1] For testing which is unrelated to fuel evaporative emission control, the specified range is 8.0–9.2.

(b) Fuels representative of commercial fuels which will generally be available through retail outlets shall be used in mileage accumulation. For unleaded fuel, the minimum lead content shall be 0.02 gram per U.S. gallon. The octane rating of the fuel used shall be in the range recommended by the manufacturer. The Reid vapor pressure of the fuel used shall be characteristic of the motor fuel during the season during which the mileage accumulation takes place.

(c) The specification range of the fuels to be used under paragraph (b) of this section shall be reported in accordance with § 85.075–2(b)(3).

### § 85.075–11 Vehicle and engine preparation (fuel evaporative emissions).

(a) (1) Apply approximate leak-proof fittings to all fuel system external vents to permit collection of effluent vapors from these vents during the course of the prescribed tests. Since the prescribed test requires the temporary plugging of the inlet pipe to the air cleaner, it will be necessary to install a probe for collecting the normal effluents from this source. Where antisurge/vent filler caps are employed on the fuel tank, plug off the normal vent if it does not conveniently lend itself to the collection of vapors which emanate from it, and introduce a separate vent, with appropriate fitting, on the cap. Where the fuel tank vent line terminus is inaccessible, sever the line at a convenient point near the fuel tank and install the collection system in a closed circuit assembly with the severed ends. All fittings shall terminate in 5/16-inch ID tube sections for ready connection to the collection systems and shall be designed for minimum dead space.

(2) The design and installation of the necessary fittings shall not disturb the normal function of the fuel system components or the normal pressure relationships in the system.

(b) (1) Inspect the fuel system carefully to insure the absence of any leaks to the atmosphere of either liquid or vapor which might affect the accuracy of the test or the performance of the control system. Corrective action, if required, shall be performed in accordance with § 85.075–6 and be reported with the test results under § 85.075–4.

(2) Care should be exercised, in the application of any pressure tests, neither to purge nor load the evaporative emission control system.

(c) Prepare fuel tank for recording the temperature of the prescribed test fuel at its approximate midvolume.

(d) Provide additional fittings and adapters, as required, to accommodate a fuel drain at the lowest point possible in the tank as installed on the vehicle.

**§ 85.075–12 Vehicle preconditioning (fuel evaporative emissions).**

Vehicles to be tested for compliance with the fuel evaporative emissions standard of this subpart shall be preconditioned as follows:

(a) The test vehicle shall be operated under the conditions prescribed for mileage accumulation, § 85.075–7, for 1 hour immediately prior to the operations prescribed below.

(b) The fuel tank shall be drained and specified test fuel (§ 85.075–10(a)) added. The evaporative emission control system or device shall not be abnormally purged or loaded as a result of draining or fueling the tank.

(c) The test vehicle shall be placed on the dynamometer and operated over a simulated trip, according to the applicable requirements and procedures of § 85.075–14 through § 85.075–19 except that the engine need not be cold when started. The test vehicle may be used to set dynamometer horsepower, if necessary. During this operation the ambient temperature shall be between 68° F. and 86° F.

(d) The engine and cooling fan shall be stopped upon completion of the dynamometer operation and the vehicle permitted to soak either on or off the dynamometer stand at an ambient temperature between 76° F. and 86° F. for a period of not less than 1 hour prior to the soak period prescribed in § 85.075–13(a)(1).

**§ 85.075–13 Evaporative emission collection procedure.**

The standard test procedure consists of three parts described below which shall be performed in sequence and without any interruption in the test conditions prescribed.

(a) *Diurnal breathing loss test.* (1) The test vehicle shall be allowed to "soak" in an area where the ambient temperature is maintained between 60° F. and 86° F. for a period of not less than 10 hours. (The vehicle preparation requirements of § 85.075–11 may be performed during this period.) It shall then be transferred to a soak area where the ambient temperature is maintained between 76° F. and 86° F. Upon admittance to the 76° F.–86° F. soak area, the prescribed fuel tank thermocouple shall be connected to the recorder and the fuel and ambient temperatures recorded at a chart speed of approximately 12 inches per hour (or equivalent record).

(2) The fuel tank of the prepared test vehicle, preconditioned according to § 85.075–12, shall be drained and recharged with the specified test fuel, § 85.075–10(a), to the prescribed "tank fuel volume," defined in § 85.002. The temperature of the fuel following the charge to the tank shall be 60° F.±2° F. Care should be exercised against abnormal loading of the evaporative emission control system or device as a result of fueling the tank.

(3) Immediately following the fuel charge to the tank, the exhaust pipe(s) and inlet pipe to the air cleaner shall be plugged and the prescribed vapor collection systems installed on all fuel system external vents. Multiple vents may be connected to a single collection trap provided that, where there is more than one external vent on a fuel system distinguishing between carburetor and tank vapors, separate collection systems shall be employed to trap the vapors from the separate sources. Every precaution shall be taken to minimize the lengths of the collection tubing employed and to avoid sharp bends across the entire system.

(4) Artificial means shall be employed to heat the fuel in the tank to 84° F.±2 F. The prescribed temperature of the fuel shall be achieved over a period of 60 minutes ±10 minutes at a constant rate of change of temperature with respect to time. After a minimum of 1 hour, following admittance to the 76° F.–86° F. soak area, the vehicle shall be moved onto the dynamometer stand for the subsequent part of the test. The fuel tank thermocouple may be temporarily disconnected to permit moving the test vehicle. Plugs shall be removed from the exhaust pipe(s) and inlet pipe to the air cleaner.

(b) *Running loss test.* (1) The vehicle shall be placed on the dynamometer and the fuel tank thermocouple reconnected. The fuel temperature and the ambient air temperature shall be recorded at a chart speed of approximately 12 inches per hour (or equivalent record).

(2) Where an external vent is located such that any "running loss" emissions would be inducted into the engine, the vapor loss measurement system shall be temporarily disconnected from that vent and clamped. Vapor losses from this vent need not be measured during this part of the test.

(3) The vehicle shall be operated on the dynamometer according to the requirements and procedures of §§ 85.075–14 through 85.075–24. The engine and fan shall be turned off upon completion of the dynamometer run and the exhaust and air cleaner inlet pipes shall be replugged.

(4) Vapor losses need not be measured during the 10-minute soak or 505-second "hot" start test. Any vapor loss collection system used during the cold start shall be temporarily disconnected and clamped. At the end of the hot start test, the vapor collection systems shall be reconnected for the following phase.

(c) *Hot soak test.* Upon completion of the dynamometer run, the test vehicle shall be permitted to soak with hood down for a period of 1 hour at an ambient temperature between 76° F. and 86° F. This operation completes the test. The traps are disconnected and weighed according to § 85.075–21.

**§ 85.075–14 Dynamometer driving schedule.**

(a) The dynamometer driving schedule to be followed consists of a nonrepetitive series of idle, acceleration, cruise, and deceleration modes of various time sequences and rates. The driving schedule is defined by a smooth transition through the speed vs. time relationships listed in Appendix I. The time sequence begins upon starting the vehicle according to the startup procedure described in § 85.075–19.

(b) The speed tolerance at any given time on the dynamometer driving schedule prescribed in Appendix I or as printed on a driver's aid chart approved by the Administrator is defined by upper and lower limits. The upper limit is 2 m.p.h. higher than the highest point on the trace within 1 second of the given time. The lower limit is 2 m.p.h. lower than the lowest point on the trace within 1 second of the given time. Speed variations greater than the tolerances (such as occur when shifting manual transmission vehicles) are acceptable provided they occur for less than 2 seconds on any one occasion. Speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences. Further, speed deviations from those prescribed due to stalling are acceptable provided the provisions of § 85.075–19(f) are adhered to.

**§ 85.075–15 Dynamometer procedure.**

(a) The dynamometer run consists of two tests, a "cold" start test after a minimum 12-hour soak according to the provisions of §§ 85.075–12 and 85.075–13 and a "hot" start test with a 10-minute soak between the two tests. Engine startup, operation over the driving schedule, and engine shutdown make a complete cold start test. Engine startup and operation over the first 505 seconds of the driving schedule complete the hot start test. The exhaust emissions are diluted with air to a constant volume and a portion is sampled continuously during each test. The composite samples collected in bags are analyzed for hydrocarbons, carbon monoxide, carbon dioxide, and oxides of nitrogen. A parallel sample of the dilution air is similarly analyzed for hydrocarbon, carbon monoxide, and oxides of nitrogen.

(b) During dynamometer operation, a fixed speed cooling fan shall be positioned so as to direct cooling air to the vehicle in an appropriate manner with the engine compartment cover open. The fan capacity shall normally not exceed 5,300 c.f.m. If, however, the manufacturer can show that during field operation the vehicle receives additional cooling, the fan capacity may be increased or

additional fans used if approved in advance by the Administrator. In the case of vehicles with front engine compartments, the fan(s) shall be squarely positioned between 8 and 12 inches in front of the cooling air inlets (grill). In the case of vehicles with rear engine compartments (or if special designs make the above impractical), the cooling fan(s) shall be placed in a position to provide sufficient air to maintain engine cooling.

(c) The vehicle shall be nearly level when tested in order to prevent abnormal fuel distribution.

(d) Flywheels, electrical or other means of simulating inertia as shown in the following table shall be used. If the equivalent inertia specified is not available on the dynamometer being used, the next higher equivalent inertia (not to exceed 250 lbs.) available shall be used.

| Loaded vehicle weight, pounds | Equivalent inertia weight, pounds | Road load power @ 50 m.p.h., horsepower |
|---|---|---|
| Up to 1,125 | 1,000 | 5.9 |
| 1,126 to 1,375 | 1,000 | 6.5 |
| 1,376 to 1,625 | 1,500 | 7.1 |
| 1,626 to 1,875 | 1,750 | 7.7 |
| 1,876 to 2,125 | 2,000 | 8.3 |
| 2,126 to 2,375 | 2,250 | 8.8 |
| 2,376 to 2,625 | 2,500 | 9.4 |
| 2,626 to 2,875 | 2,750 | 9.9 |
| 2,876 to 3,250 | 3,000 | 10.3 |
| 3,251 to 3,750 | 3,500 | 11.2 |
| 3,751 to 4,250 | 4,000 | 12.0 |
| 4,251 to 4,750 | 4,500 | 12.7 |
| 4,751 to 5,250 | 5,000 | 13.4 |
| 5,251 to 5,750 | 5,500 | 13.9 |
| 5,751 to above | 5,500 | 14.4 |

(e) Power absorption unit adjustment.

(1) The power absorption unit shall be adjusted to reproduce road load power at 50 m.p.h. true speed. The indicated road load power setting shall take into account the dynamometer friction. The relationship between road load (absorbed) power and indicated road load power for a particular dynamometer shall be determined by the procedure outlined in Appendix II or other suitable means.

(2) The road load power listed in the table above shall be used or the vehicle manufacturer may determine the road load power by the following procedure and request its use:

(i) Measuring the absolute manifold pressure of a representative vehicle, of the same equivalent inertia weight class, when operated on a level road under balanced wind conditions at a true speed of 50 m.p.h., and

(ii) Noting the dynamometer indicated road load horsepower setting required to reproduce that manifold pressure when the same vehicle is operated on the dynamometer at a true speed of 50 m.p.h. The tests on the road and on the dynamometer shall be performed with the same vehicle ambient absolute pressure (usually barometric), i.e. within ±5 mm. Hg.

(iii) The road load power shall be determined according to the procedure outlined in Appendix II and adjusted according to the following if applicable.

(3) Where it is expected that more than 33 percent of the vehicles in an engine family will be equipped with air conditioning, the road load power listed above or as determined in paragraph (e)(2) of this section shall be increased by 10 percent for testing all test vehicles representing such engine family if those vehicles are intended to be offered with air conditioning in production.

(f) The vehicle speed (m.p.h.) as measured from the dynamometer rolls shall be used for all conditions. A speed vs. time recording, as evidence of dynamometer test validity, shall be supplied on request of the Administrator.

(g) Practice runs over the prescribed driving schedule may be performed at test points, provided an emission sample is not taken, for the purpose of finding the minimum throttle action to maintain the proper speed-time relationship, or to permit sampling system adjustments to comply with § 85.075–20(b)(2).

NOTE: When using two-roll dynamometers a truer speed-time trace may be obtained by minimizing the rocking of the vehicle in the rolls. The rocking of the vehicle changes the tire rolling radius on each roll. The rocking may be minimized by restraining the vehicle horizontally (or nearly so) by using a cable and winch.

(h) The drive wheel tires may be inflated up to 45 p.s.i.g. in order to prevent tire damage. The drive wheel tire pressure shall be reported with the test results.

(i) If the dynamometer has not been operated during the 2-hour period immediately preceding the test it shall be warmed up for 15 minutes by operating it at 30 m.p.h. using a nontest vehicle.

(j) Changes to dynamometer horsepower settings, if required, shall be made within 1 hour of the exhaust emission measurement test phase. The test vehicle shall not be used to make this adjustment.

### § 85.075–16 Three-speed manual transmissions.

(a) All test conditions except as noted shall be run in highest gear.

(b) Cars equipped with free wheeling or overdrive units shall be tested with this unit (free wheeling or overdrive) locked out of operation.

(c) Idle shall be run with transmission in gear and with clutch disengaged (except first idle; see § 85.075–19).

(d) The vehicle shall be driven with minimum throttle movement to maintain the desired speed.

(e) Acceleration modes shall be driven smoothly with the shift speeds as recommended by the manufacturer. If the manufacturer does not recommend shift speeds, the vehicle shall be shifted from first to second gear at 15 m.p.h. and from second to third gear at 25 m.p.h. The operator shall release the accelerator pedal during the shift, and accomplish the shift with minimum closed throttle time. If the vehicle cannot accelerate at the specified rates, the vehicle shall be accelerated at WOT until the vehicle speed reaches the speed at which it should be at that time during the test.

(f) The deceleration modes shall be run with clutch engaged and without shifting gears from the previous mode, using brakes or throttle as necessary to maintain the desired speed. For those modes which decelerate to zero, the clutch shall be depressed when the speed drops below 15 m.p.h., when engine roughness is evident, or when engine stalling is imminent.

(g) Downshifting is allowed at the beginning of or during a power mode if recommended by the manufacturer or if the engine obviously is lugging.

### § 85.075–17 Four-speed and five-speed manual transmissions.

(a) Use the same procedure as for three-speed manual transmissions for shifting from first to second gear and from second to third gear. If the manufacturer does not recommend shift speeds, the vehicle shall be shifted from third to fourth gear at 40 m.p.h. Fifth gear may be used at the manufacturer's option.

(b) If transmission ratio in first gear exceeds 5:1, follow the procedure for three- or four-speed manual transmission vehicles as if the first gear did not exist.

### § 85.075–18 Automatic transmissions.

(a) All test conditions shall be run with the transmission in "Drive" (highest gear). Automatic stick-shift transmissions may be shifted as manual transmissions at the option of the manufacturer.

(b) Idle modes shall be run with the transmission in "Drive" and the wheels braked (except first idle; see § 85.075–19).

(c) The vehicle shall be driven with minimum throttle movement to maintain the desired speed.

(d) Acceleration modes shall be driven smoothly allowing the transmission to shift automatically through the normal sequence of gears. If the vehicle cannot accelerate at the specified rates, the vehicle shall be accelerated at WOT until the vehicle speed reaches the speed at which it should be at that time during the driving schedule.

(e) The deceleration modes shall be run in gear using brakes or throttle as necessary to maintain the desired speed.

### § 85.075–19 Engine starting and restarting.

(a) The engine shall be started according to the manufacturer's recommended starting procedures. The initial 20-second-idle period shall begin when the engine starts.

(b) Choke operation:

(b)(1) Vehicles equipped with automatic chokes shall be operated according to the instructions which will be included in the manufacturer's operating instructions or owner's manual including choke setting and "kick-down" from cold fast idle. The transmission shall be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.

(2) Vehicles equipped with manual chokes shall be operated according to the manufacturer's operating instructions or owners manual.

(c) The operator may use the choke, throttle, etc. where necessary to keep the engine running.

(d) If the manufacturer's operating or owner's manual does not specify a warm engine starting procedure, the engine (automatic and manual choke engines) shall be started by depressing the acceleration pedal about half way and cranking the engine until it starts.

(e) If the vehicle does not start after 10 seconds of cranking, cranking shall cease and the reason for failure to start determined. The revolution counter on the constant volume sampler (see § 85.075–24, Dynamometer test runs) shall be turned off and the sample solenoid valves placed in the "dump" position during this diagnostic period. In addition, either the positive displacement pump should be turned off or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is an operational error, the vehicle shall be rescheduled for testing from a cold start. If failure to start is caused by vehicle malfunction, corrective action of less than 30 minutes duration may be taken and the test continued. The sampling system shall be reactivated at the same time cranking is started. When the engine starts, the driving schedule timing sequence shall begin. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

(e) If the engine "false starts", the operator shall repeat the recommended starting procedure (such as resetting the choke, etc.).

(f) Stalling:

(1) If the engine stalls during an idle period, the engine shall be restarted immediately and the test continued. If the engine cannot be started soon enough to allow the vehicle to follow the next acceleration as prescribed, the driving schedule indicator shall be stopped. When the vehicle restarts the driving schedule indicator shall be reactivated.

(2) If the engine stalls during some operating mode other than idle, the driving schedule indicator shall be stopped, the vehicle restarted, accelerated to the speed required at that point in the driving schedule and the test continued.

(3) If the vehicle will not restart within 1 minute, the test shall be voided, the vehicle removed from the dynamometer, corrective action taken, and the vehicle rescheduled for test. The reason for the malfunction (if determined) and the corrective action taken shall be reported.

**§ 85.075–20 Sampling and analytical system (exhaust emissions).**

(a) *Schematic drawings.* The following figures (Figs. A75–1 and A75–2) are schematic drawings of the exhaust gas sampling and analytical systems which will be used for testing under the regulations in this part. Additional components such as instruments, valves, solenoids, pumps, and switches may be used to provide additional information and coordinate the functions of the component systems.

(b) Component description (exhaust gas sampling system). The following components will be used in the exhaust gas sampling system for testing under the regulations in this subpart. See figure A75–1. Other types of constant volume samplers may be used if shown to yield equivalent results and if approved in advance by the Administrator.

(1) A dilution air filter assembly consisting of a particulate (paper) filter to remove solid matter from the dilution air and thus increase the life of the charcoal filter; a charcoal filter to reduce and stabilize the background hydrocarbon level; and a second particulate filter to remove charcoal particles from the air stream. The filters shall be of sufficient capacity and the duct which carries the dilution air to the point where the exhaust gas is added shall be of sufficient size so that the pressure at the mixing point is less than 1 inch of water pressure below ambient when the constant volume sampler is operating at its maximum flow rate.

(2) A leak-tight connector and tube to the vehicle tailpipe. The tubing shall be sized and connected in such a manner that the static pressure variations in the vehicle tailpipe(s) remain within ±5 inches of water of the static pressure variations measured during a dynamometer driving cycle with no connection to the tailpipe(s). Sampling systems capable of tolerances to ±1 inch of water will be used by the Administrator upon written request by the manufacturer.

(3) A heating system to preheat the heat exchanger to within ±10° F. of its operating temperature before the test begins.

(4) A heat exchanger capable of limiting the gas mixture temperature variation during the entire test to ±10° F. as measured at a point immediately ahead of the positive displacement pump.

(5) A positive displacement pump to pump the dilute exhaust mixture. The pump capacity (300 to 350 c.f.m. is sufficient for testing most vehicles) shall be large enough to virtually eliminate water condensation in the system. See Appendix III for one flow calibration technique. Other suitable calibration techniques may be used if approved in advance by the Administrator.

(6) Temperature sensor (T1) with an accuracy of ±2° F. to allow continuous recording of the temperature of the dilute exhaust mixture entering the positive displacement pump. (See § 85.075–22)(1).)

(7) Gauge (G1) with an accuracy of ±3 mm. Hg to measure the pressure depression of the dilute exhaust mixture entering the positive displacement pump, relative to atmospheric pressure.

(8) Gauge (G2) with an accuracy of ±3 mm. Hg to measure the pressure increase across the positive displacement pump.

(9) Sample probes (S1 and S2) pointed upstream to collect samples from the dilution airstream and the dilute exhaust mixture.

(10) Filters (F1 and F2) to remove particulate matter from dilution air and dilute exhaust samples.

(11) Pumps (P1 and P2) to pump the dilution air and dilute exhaust into their respective sample collection bags.

(12) Flow control valves (N1 and N2) to regulate flows to sample collection bags, at constant flow rates. The minimum sample flow rate shall be 10 c.f.h.

(13) Flowmeters (FL1 and FL2) to insure, by visual observation, that constant flow rates are maintained throughout the test.

(14) Three-way solenoid valves (V1, V2, V3, and V4) to direct sample streams to either their respective bags or overboard.

(15) Quick-connect, leak-tight fittings (C1, C2, C3, and C4) with automatic shutoff on bag side to attach sample bags to sample system.

(16) Sample collection bags for dilution air and exhaust samples of sufficient capacity so as not to impede sample flow.

(17) Revolution counters to count the revolutions of the positive displacement pump while each test phase is in progress and samples are being collected.

(c) *Component description (exhaust gas analytical system).* The following components will be used in the exhaust gas analytical system for testing under the regulations in this part. The analytical system provides for the determination of hydrocarbon concentrations by flame ionization detector (FID) analysis, the determination of carbon monoxide and carbon dioxide concentrations by nondispersive infrared (NDIR) analysis and the determination of oxides of nitrogen concentrations by chemiluminescence (CL) analysis in dilute exhaust samples. The chemiluminescence method of analysis requires that the nitrogen dioxide present in the sample be converted to nitric oxide before analysis. See Appendix V. Other types of analyzers may be used if shown to yield equivalent results and if approved in advance by the Administrator. See Figure A75–2.

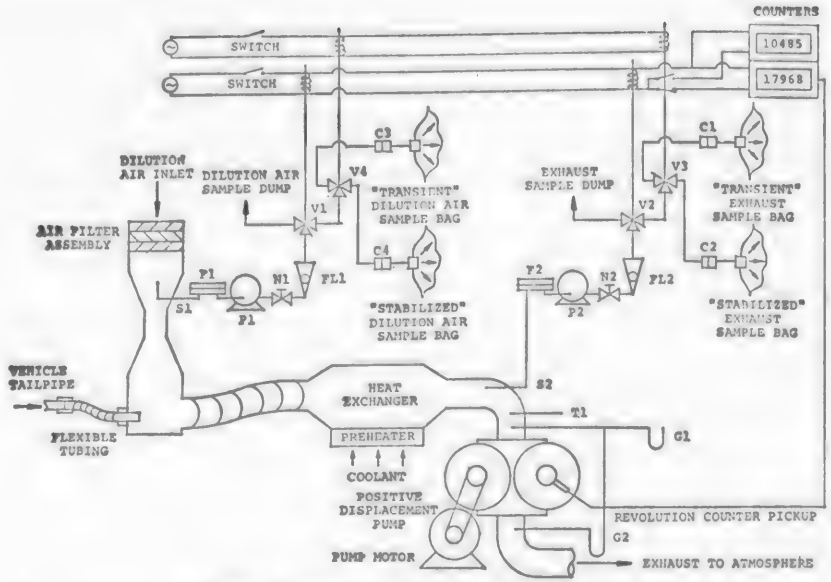



**Figure A75–1—Exhaust Gas Sampling System**

(1) Quick-connect leak-tight fitting (C5) to attach sample bags to analytical system.

(2) Filter (F3) to remove any residual particulate matter from the collected sample.

(3) Pump (P3) to transfer samples from the sample bags to the analyzers.

(4) Selector valves (V5, V6, V7, V8, and V14) for directing samples, span gases or zeroing gases to the analyzers.

(5) Flow control valves (N3, N4, N5, N6, N7, N8, N9, N10, N11, N12, and N13) to regulate the gas flow rates.

(6) Flowmeters (FL3, FL4, and FL5) to indicate gas flow rates.

(7) Manifold (M1) to collect the expelled gases from the analyzers.

(8) Pump (P4) to transfer expelled gases from the collection manifold to a vent external to the test room (optional).

(9) Analyzers to determine hydrocarbon, carbon monoxide, carbon dioxide and oxides of nitrogen concentrations.

(10) An oxide of nitrogen converter to convert any $NO_2$ present in the samples to NO before analysis.

(11) Selector valves (V9 and V10) to allow the sample, span, calibrating or zeroing gases to bypass the converter.

(12) Water trap (T1) to partially remove water and a valve (V11) to allow the trap to be drained.

(13) Sample conditioning columns to remove remainder of water (WR1 and WR2 containing indicating $CaSO_4$, or indicating silica gel) and carbon dioxide (CDR1 and CDR2 containing ascarite) from the CO analysis stream.

(14) Selector valves (V12 and V13) to permit switching from exhausted absorbing columns to fresh columns.

(15) Water bubbler (W1) to allow saturation of the $CO_2$ span gas to check efficiency of absorbing columns.

(16) Recorders (R1, R2, R3, and R4) or digital printers to provide permanent records of calibration, spanning and sample measurements; or in those facilities where computerized data acquisition systems are incorporated, the computer facility printout may be used.

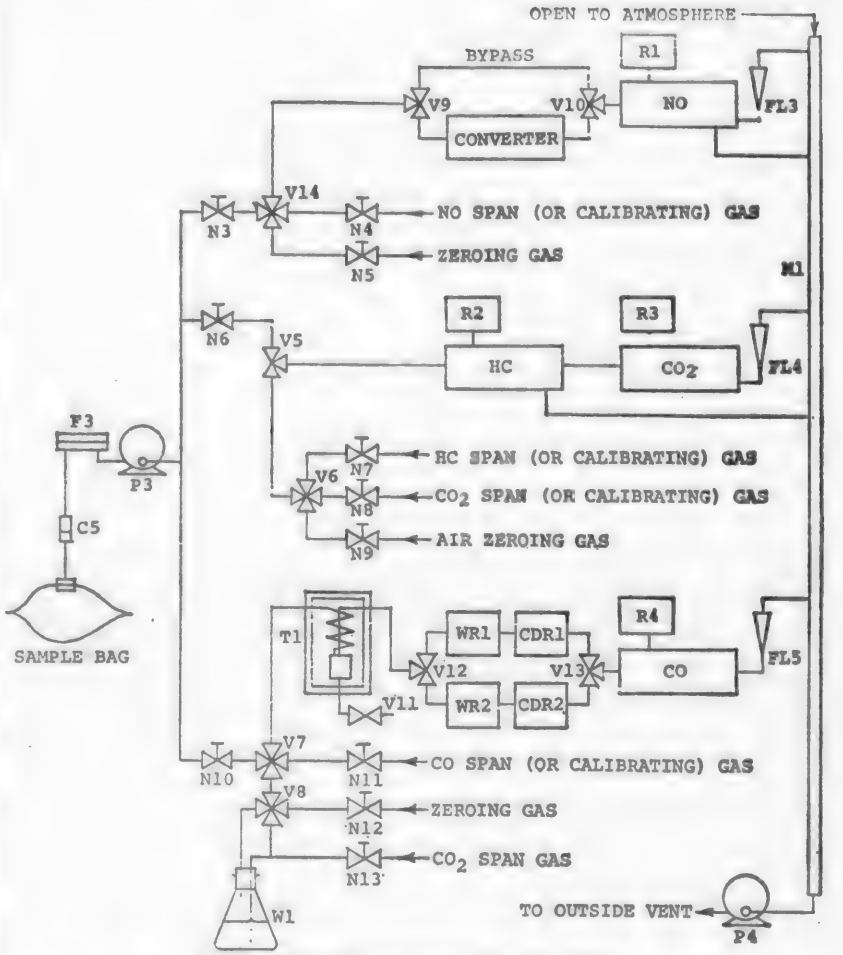



FIGURE A75–2.—Exhaust gas analytical system.

**§ 85.075–21 Sampling and analytical system (fuel evaporative emissions).**

(a) *Schematic drawing.* (1) The following figures (Figures A75–3, A75–4, and A75–5) are flow diagrams of typical evaporative loss collection applications.

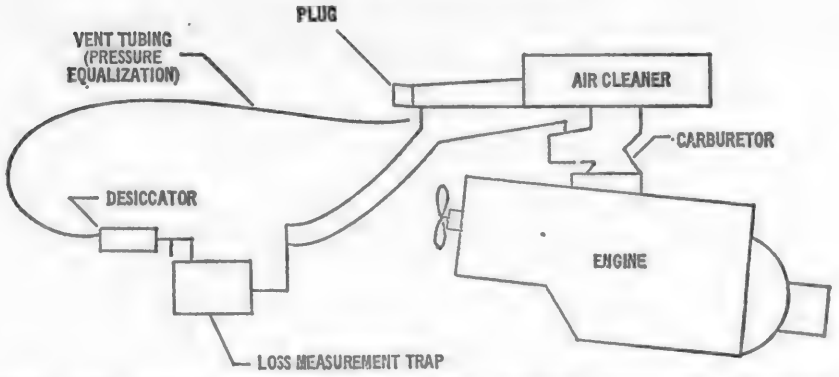



FIGURE A75-3.—Typical carburetor evaporative loss collection arrangement (schematic).

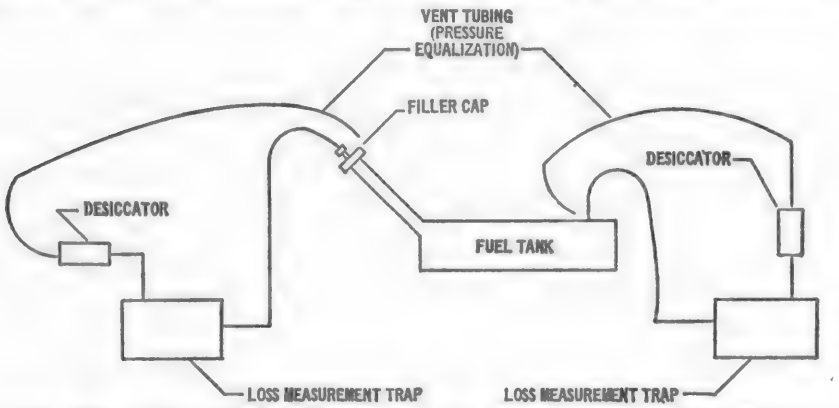



FIGURE A75-4.—Typical fuel tank evaporative loss collection arrangement (schematic).

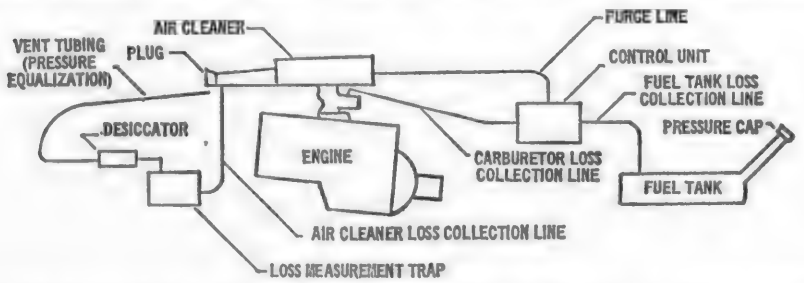



FIGURE A75-5.—Typical fuel evaporative loss collection arrangement for vehicle equipped with evaporative emission control system (schematic).

(2) Figure A75–3 represents an arrangement for collecting losses which emanate from the carburetor. Figure A75–4 depicts the means for separately collecting the vapors which emanate from the fuel tank vent line and filler cap. Figure A75–5 shows an arrangement for collecting the losses from a closed fuel system, vented to the atmosphere solely through the air cleaner, as might be the case with certain fuel evaporative emission control devices.

(3) Schematic drawings of arrangements to be employed shall be submitted in accordance with § 85.075–2(b)(3).

(b) *Collection equipment.* The following equipment shall be used for this collection of fuel evaporative emissions. (Item quantities are determined by individual test needs.)

(1) *Activated carbon trap.* See Figure A75–6 for specifications of one design; other configurations may be used: *Provided,* That they give demonstrably equivalent results.

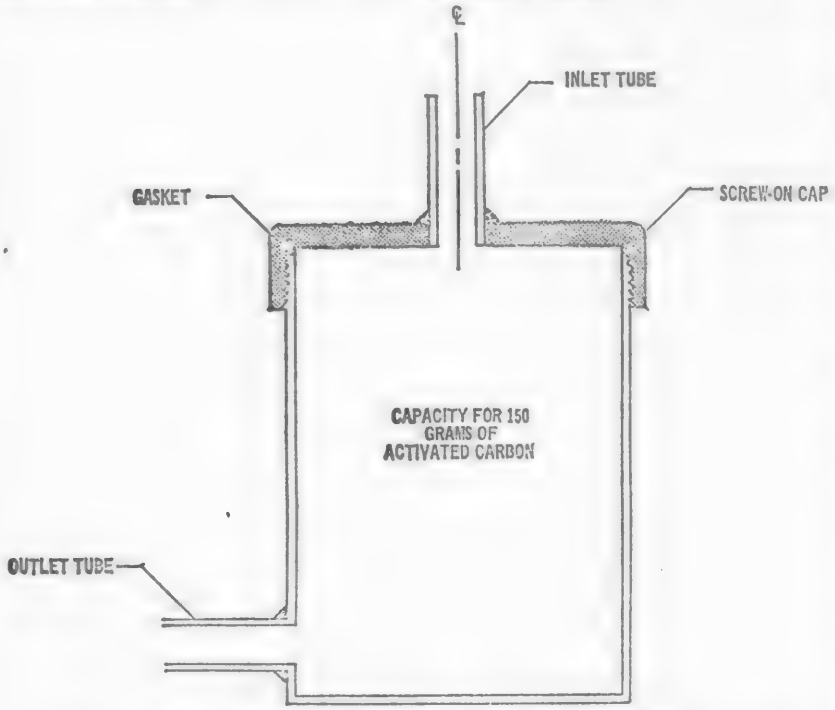



FIGURE A75–6.—Typical activated carbon trap (schematic).

(i) Canister—300±25 ml., cylindrical container having a length to diameter ratio of 1.4±0.1. An inlet tube, 5/16 inch ID and 1 inch long is sealed into the top of the canister, at its geometric center. A similar outlet tube is sealed into the wall ¼ inch from the bottom of the canister. The canister is designed to withstand an air pressure of 2 p.s.i., when sealed, without evidence of leaking when immersed in water for 30 seconds.

(ii) Activated carbon—meeting the following specifications:

| | |
|---|---|
| Surface area, min. ($N_2$ BET method)[1] | 1,000 square meters per gram. |
| Adsorption capacity, min. (carbon tetrachloride) | 60 percent, by weight. |
| Volatile material including adsorbed water vapor. | None. |

| Screen analysis size: | *Percent* |
|---|---|
| Less than 1.4 mm | 0 |
| 1.7–2.4 mm | 90–100 |
| More than 3.0 mm | 0 |

[1] Brunauer, Emmett & Teller: Journal of the American Chemical Society, Vol. 60, p. 309, 1938.

The activated carbon trap is prepared for the test by attaching clamped sections of vinyl tubing to the inlet and outlet tubes of the canister. The canister is then filled with 150±10 gm. hot activated carbon which had previously been oven-dried for 3 hours at 300° F. Loss of carbon through the inlet and outlet tubes is prevented through the use of wire screens of 0.7 mm. mesh or wads of loosely packed glass wool. The canister is closed immediately after filling and the carbon is allowed to cool while the trap is vented through a drying tube via the unclamped outlet arm.

(iii) The trap is sealed and weighed after cooling and the weight, to the nearest 0.1 gram, is inscribed on the canister body. Within 12 hours of the scheduled test, the weight of the trap is checked and if it has changed by more than 0.5 gm., it is redried to constant weight. This redrying operation is performed by passing dry nitrogen, heated to 275° F., through the trap, via the inlet tube, at a rate of 1 liter per minute until checks made at 30-minute intervals do not vary by more than 0.1 percent of the gross weight. The trap and its contents are allowed to cool to room temperature, while vented through a drying tube via the outlet arm, before use.

(2) *Auxiliary collection equipment.* (i) Drying tube—transparent, tubular body ¾ inch ID, 6 inches long, with serrated tips and removable caps.

(ii) Desiccant—indicating variety, 8 mesh. The drying tube is attached to the outlet tube of the collection traps to prevent ambient moisture from entering the trap. It is prepared by filling the empty drying tube with fresh desiccant using loose wad of glass wool to hold the desiccant in place. The desiccant is renewed when three-quarters spent, as indicated by color change.

(iii) Collection tubing—stainless steel or aluminum, 5/16 inch ID, for connecting the collection traps to the fuel system vents.

(iv) Polyvinyl chloride (vinyl) tubing—flexible tubing, 5/16 inch ID, for sealing butt-to-butt joints.

(v) Laboratory tubing—air tight flexible tubing 5/16 inch ID, attached to the outlet end of the drying tubes to equalize collection system pressure.

(vi) Clamps—hosecock, openside, for pinching off flexible tubing.

(c) *Weighing equipment.* The balance and weights used shall be capable of determining the net weight of the activated carbon trap within an accuracy of ±75 mg.

(d) *Temperature measuring equipment.* (1) Temperature recorder—multichannel, variable speed, potentiometric, or substantially equivalent, recorder with a temperature range of 50° F. to 100° F. and capable of either simultaneous or sequential recording of the ambient air and fuel temperatures within an accuracy of ±1° F.

(2) Fuel tank thermocouples—iron-constantan (type J) construction.

(3) Other types of temperature sensing systems may be provided by the manufacturer if they record the information specified in subparagraph (1) of this paragraph with the required accuracy and if they are self-contained. Type J thermocouples are required for compatibility with recording instruments used in Federal certification facilities.

(e) *Assembly and use of the activated carbon vapor collection system.* (1) The prepared activated carbon trap, dried to constant weight, cooled to the ambient temperature and sealed with clamped sections of vinyl tubing is carefully weighed to the nearest 20 milligrams and the weight recorded as the "tare weight."

(2) A drying tube is attached to the outlet tube and the clamp released, but not removed. A length of flexible tubing, for pressure equalization, is connected to the other end of the drying tube.

(3) The inlet tube of the adsorption trap and external vent(s) of the fuel system will be connected by minimal lengths of stainless steel or aluminum tubing and short sections of vinyl tubing. Butt-to-butt joints shall be made

wherever possible and precautions taken against sharp bends in the connection lines, including any manifold systems employed to connect multiple vents to a single trap.

(4) The clamp on the inlet tube of the trap shall be released but not removed. Care shall be exercised to prevent heating the vapor collection trap by radiant or conductive heat from the engine.

(5) Upon completion of the collection sequence, the vinyl tubing sections on each arm of the collection trap shall be clamped tight and the collection system dismantled.

(6) The sealed vapor collection trap shall be weighed carefully to the nearest 20 milligrams. This constitutes the "gross weight," which is appropriately recorded. The difference between the "gross weight" and "tare weight" represents the "net weight" for purposes of calculating the fuel vapor losses.

**§ 85.075–22 Information to be recorded.**

The following information shall be recorded with respect to each test:

(a) Test number.

(b) System or device tested (brief description).

(c) Date and time of day for each part of the test schedule.

(d) Instrument operator.

(e) Driver or operator.

(f) Vehicle: Make—Vehicle identification number—Model year—Transmission type—Odometer reading—Engine displacement — Engine family — Idle r.p.m.—Fuel system—(fuel injection, nominal fuel tank capacity, fuel tank location, number of carburetors, number of carburetor barrels)—Inertia loading—Estimated curb weight recorded at 0 miles—Actual road load horsepower at 50 m.p.h. and drive wheel tire pressure.

(g) Dynamometer serial number and indicated road load power absorption at 50 m.p.h.

(h) All pertinent instrument information such as tuning—gain—serial number—detector number—range. As an alternative, a reference to a vehicle test cell number may be used, with the advance approval of the Administrator, provided test cell calibration records show the pertinent instrument information.

(i) Recorder charts: Identify zero, span, exhaust gas, and dilution air sample traces.

(j) Test cell barometric pressure, ambient temperature, and humidity.

(k) Fuel temperatures, as prescribed.

(l) Pressure of the mixture of exhaust and dilution air entering the positive displacement pump, the pressure increase across the pump, and the temperature set point of the temperature control system. The sample temperature at the inlet to the pump may be measured, if desired, to verify that the temperature variations are within 5° F. of the set point.

(m) The number of revolutions of the positive displacement pump accumulated while the test is in progress and exhaust flow samples are being collected.

(n) The humidity of the dilution air.

**§ 85.075–23 Analytical system calibration and sample handling.**

(a) Calibrate the analytical assembly at least once every 30 days. Use the same flow rate as when analyzing samples.

(1) Adjust analyzers to optimize performance.

(2) Zero the hydrocarbon analyzer with zero grade air and the carbon monoxide, carbon dioxide, and oxides of nitrogen analyzers with zero grade nitrogen. The allowable zero gas impurity concentrations should not exceed 1 p.p.m. equivalent carbon response, 1 p.p.m. carbon monoxide, 300 p.p.m. (0.03 mole percent) carbon dioxide, and 0.1 p.p.m. nitric oxide.

(3) Set the CO and $CO_2$ analyzer gains to give the desired range. Select the desired attenuation scale of the HC analyzer, set the capillary flow rate by adjusting the back pressure regulator, and adjust the electronic gain control, if provided, to give the desired range. Select the desired scale of the $NO_x$ analyzer and adjust the phototube high voltage supply or amplifier gain to give the desired range.

(4) Calibrate the HC analyzer with propane (air diluent) gases having nominal concentrations equal to 50 and 100 percent of full scale. Calibrate the CO analyzer with carbon monoxide (nitrogen diluent) gases and the $CO_2$ analyzer with carbon dioxide (nitrogen diluent) gases having nominal concentrations equal to 10, 25, 40, 50, 60, 70, 85, and 100 percent of full scale. Calibrate the $NO_x$ analyzer with nitric oxide (nitrogen diluent) gases having nominal concentrations equal to 50 and 100 percent of full scale. The actual concentrations should be known to within ±2 percent of the true values.

(5) Compare values obtained on the CO and $CO_2$ analyzers with previous calibration curves. Any significant change reflects some problem in the system. Locate and correct problem, and recalibrate. Use best judgment in selecting curves for data reduction.

(6) $NO_x$ converter efficiency determination: The apparatus described and illustrated in Figure A 75–7 is to be used to determine the conversion efficiency of devices that convert $NO_x$ to NO.

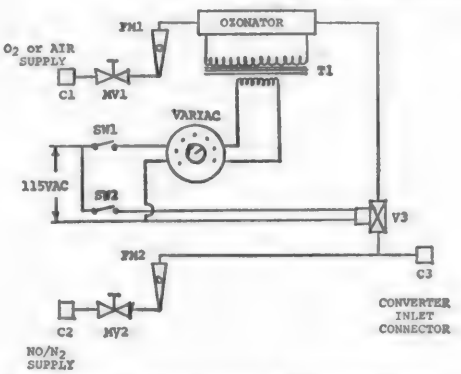



FIGURE A 75–7—$NO_x$ Converter Efficiency Detector.

The following procedure is to be used for determining the values to be used in Equation (A).

(i) Attach the NO/$N_2$ supply (150–250 ppm) at C2, the $O_2$ supply at C1 and the analyzer inlet connection to the efficiency detector at C3. If lower concentrations of NO are used, air may be used in place of $O_2$ to facilitate better control of the $NO_2$ generated during step (iv).

(ii) With the efficiency detector variac off, place the $NO_x$ converter in bypass mode and close valve V3. Open valve MV2 until sufficient flow and stable readings are obtained at the analyzer. Zero and span the analyzer output to indicate the value of the NO concentration being used. Record this concentration.

(iii) Open valve V3 (on/off flow control solenoid valve for $O_2$) and adjust valve MV1 ($O_2$ supply metering valve) to blend enough $O_2$ to lower the NO concentration (ii) about 10 percent. Record this concentration.

(iv) Turn on the ozonator and increase its supply voltage until the NO concentration of (iii) is reduced to about 20 percent of (ii). $NO_2$ is now being formed from the NO+$O_2$ reaction. There must always be at least 10 percent unreacted NO at this point. Record this concentration.

(v) When a stable reading has been obtained from (iv), place the $NO_x$ converter in the convert mode. The analyzer will now indicate the total $NO_x$ concentration. Record this concentration.

(vi) Turn off the ozonator and allow the analyzer reading to stabilize. The mixture NO+$O_2$ is still passing through the converter. This reading is the total $NO_x$ concentration of the dilute NO span gas used at step (iii). Record this concentration.

(vii) Close valve V3. The NO concentration should be equal to or greater than the reading of (ii) indicating whether the NO contains any $NO_2$.

Calculate the efficiency of the $NO_x$ converter by substituting the concentrations obtained during the test into Equation (A).

$$\% \text{ Eff.} = \frac{(vi)-(iv)}{(v)-(iv)} \times 100\%$$

The efficiency of the converter should be greater than 90 percent. Adjusting the

converter temperature may be needed to maximize the efficiency. Efficiency checks should be made on each analyzer range using an NO span gas concentration appropriate to the instrument range.

(7) Check the efficiency of the sample conditioning system by the following procedure:

(i) Zero and span the CO instrument on its most sensitive scale.

(ii) Recheck zero.

(iii) Bubble $CO_2$ span gas through water and then through the sample conditioning system into the CO instrument. If the CO instrument shows no response to the wet $CO_2$ the columns are in good condition.

(iv) If the CO instrument responds to wet $CO_2$, replace columns as necessary to bring response back to zero.

(v) The conditioning system efficiency should be checked daily.

(b) HC, CO, $CO_2$, and $NO_x$ measurements: Allow a minimum of 20 minutes warmup for the HC analyzer and 2 hours for the CO, $CO_2$, and $NO_x$ analyzers. (Power is normally left on infrared and chemiluminescence analyzers; but when not in use, the chopper motors of the infrared analyzers are turned off and the phototube high voltage supply of the chemiluminescence analyzer is placed in the standby position.) The following sequence of operations should be performed in conjunction with each series of measurements:

(1) Zero the analyzers. Obtain a stable zero on each amplifier meter and recorder. Recheck after tests.

(2) Introduce span gases and set the CO and $CO_2$ analyzer gains, the HC analyzer sample capillary flow rate and the $NO_x$ analyzer high voltage supply or amplifier gain to match the calibration curves. In order to avoid corrections, span and calibrate at the same flow rates used to analyze the test samples. Span gases should have concentrations equal to approximately 80 percent of full scale. If gain has shifted significantly on the CO or $CO_2$ analyzers, check tuning. If necessary, check calibration. Recheck after test. Show actual concentrations on chart.

(3) Check zeroes; repeat the procedure in subparagraphs (1) and (2) of this paragraph if required.

(4) Check flow rates and pressures.

(5) Measure HC, CO, $CO_2$, and $NO_x$ concentrations of samples. Care should be exercised to prevent moisture from condensing in the sample collection bag.

(6) Check zero and span points.

(c) For the purposes of this section, the term "zero grade air" includes artificial "air" consisting of a blend of nitrogen and oxygen with oxygen concentrations between 18 and 21 mole percent.

**§ 85.075–24 Dynamometer test runs.**

(a) The vehicle shall be allowed to stand with the engine turned off for a period of not less than 12 hours before the cold start exhaust emission test, at an ambient temperature as specified in §§ 85.075–12 and 85.075–13. The vehicle shall be stored prior to the emission tests in such a manner that precipitation (e.g. rain or dew) does not occur on the vehicle. The complete dynamometer test consists of a cold start drive of 7.5 miles and simulates a hot start drive of 7.5 miles. The vehicle is allowed to stand on the dynamometer during the 10-minute time period between the cold and hot start tests. The cold start test is divided into two periods. The first period, representing the cold start "transient" phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the "stabilized" phase, consists of the remainder of the driving schedule including engine shutdown. The hot start test similarly consists of two periods. The first period, representing the hot start "transient" phase, terminates at the same point in the driving schedule as the first phase of the cold start test. The second period of the hot start test, "stabilized" phase, is assumed to be identical to the second period of the cold start test. Therefore, the hot start test terminates after the first period (505 seconds) is run. During the tests the ambient temperature shall be between 68° F. and 86° F.

(b) The following steps shall be taken for each test:

(1) Place drive wheels of vehicle on dynamometer without starting engine.

(2) Open the vehicle engine compartment cover and start the cooling fan.

(3) With the sample solenoid valves in the "dump" position connect evacuated sample collection bags to the two dilute exhaust sample connectors and to the two dilution air sample line connectors.

(4) Start the positive displacement pump (if not already on), the sample pumps, and the temperature recorder. (The heat exchanger of the constant volume sampler should be preheated to its operating temperature before the test begins.)

(5) Adjust the sample flow rates to the desired flow rate (minimum of 10 c.f.h.) and set the revolution counters to zero.

(6) Attach the flexible exhaust tube to the vehicle tailpipe(s).

(7) Simultaneously start the revolution counter for the positive displacement pump, position the sample solenoid valves to direct the sample flow into the "transient" exhaust sample bag and the "transient" dilution air sample bag, and start cranking the engine.

(8) Fifteen seconds after the engine starts, place the transmission in gear.

(9) Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

(10) Operate the vehicle according to the dynamometer driving schedule (§ 85.075–14).

(11) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously switch the sample flows from the "transient" bags to the "stabilized" bags, switch off revolution counter No. 1 and start counter No. 2. As soon as possible and in no case longer than 20 minutes after the end of this portion of the test disconnect the "transient" exhaust and dilution air sample bags, transfer them to the analytical system and process the samples according to § 85.075–23.

(12) Turn the engine off 2 seconds after the end of the last deceleration (at 1,369 seconds).

(13) Five seconds after the engine stops running, simultaneously turn off revolution counter No. 2 and position the sample solenoid valves to the "dump" position. As soon as possible and in no case longer than 20 minutes after the end of this portion of the test disconnect the "stabilized" exhaust and dilution air sample bags, transfer them to the analytical system and process the samples according to § 85.075–23.

(14) Immediately after the end of the sample period turn off the cooling fan and close the engine compartment cover.

(15) Immediately after the end of the sample period, disconnect the exhaust tube from the tailpipe(s), turn off the cooling fan and close the engine compartment cover.

(16) Turn off the positive displacement pump.

(17) Repeat the steps in subparagraphs (2) through (10) of this paragraph for the hot start test except only one evacuated sample bag is required for sampling exhaust gas and one for dilution air. The step in subparagraph (7) of this paragraph shall begin between 9 and 11 minutes after the end of the sample period for the cold start test.

(18) At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously turn off the No. 1 revolution counter and position the sample solenoid valve to the "dump" position. (Engine shutdown is not part of the hot start test sample period.)

(19) As soon as possible and in no case longer than 20 minutes after the end of this portion of the test disconnect the hot start "transient" exhaust and dilution air sample bags, transfer them to the analytical system and process the samples according to § 85.075–23.

(20) Disconnect the exhaust tube from the vehicle tailpipe(s) and remove vehicle from dynamometer.

(21) The positive displacement pump may be turned off, if desired.

**§ 85.075–25 Chart reading.**

(a) Determine the HC, CO, $CO_2$ and $NO_x$ concentrations of the dilution air and dilute exhaust sample bags from the instrument deflections or recordings making use of appropriate calibration charts.

(b) Determine the average dilute exhaust mixture temperatures from the temperature recorder trace if a recorder is used.

**§ 85.075–26 Calculations (exhaust emissions).**

The final reported test results shall be computed by use of the following formulae:

(a) For light duty vehicles:

$$Y_{wm}=(0.43\ Y_{ct}+0.57\ Y_{ht}+Y_s)/7.5$$

where:

$Y_{wm}$ = Weighted mass emissions of each pollutant, i.e. HC, CO, or $NO_x$, in grams per vehicle mile.

$Y_{ct}$ = Mass emissions as calculated from the "transient" phase of the cold start test, in grams per test phase.

$Y_{ht}$ = Mass emissions as calculated from the "transient" phase of the hot start test, in grams per test phase.

$Y_s$ = Mass emissions as calculated from the "stabilized" phase of the cold start test, in grams per test phase.

(b) The mass of each pollutant for each phase of both the cold start test and the hot start test is determined from the following:

(1) Hydrocarbon Mass:

$$HC_{mass}=V_{mix}\times \text{Density}_{HC}\times\frac{HC_{conc}}{1{,}000{,}000}$$

(2) Oxides of nitrogen Mass:

$$NO_{x_{mass}}=V_{mix}\times \text{Density}_{NO_2}\times\frac{NO_{x_{conc}}}{1{,}000{,}000}\times K_H$$

(3) Carbon monoxide Mass:

$$CO_{mass}=V_{mix}\times \text{Density}_{CO}\times\frac{CO_{conc}}{1{,}000{,}000}$$

(c) Meaning of symbols:

$HC_{mass}$ = Hydrocarbon emissions, in grams per test phase.

$\text{Density}_{HC}$ = Density of hydrocarbons in the exhaust gas, assuming an average carbon to hydrogen ratio of 1:1.85, in grams per cubic foot at 68° F. and 760 mm. Hg pressure (16.33 gm./cu. ft).

$HC_{conc}$ = Hydrocarbon concentration of the dilute exhaust sample corrected for background, in p.p.m. carbon equivalent, i.e. equivalent propane × 3.

$$HC_{conc}=HC_e-HC_d(1-1/DF)$$

where:

$HC_e$ = Hydrocarbon concentrations of the dilute exhaust sample as measured, in p.p.m. carbon equivalent.

$HC_d$ = Hydrocarbon concentration of the dilution air as measured in p.p.m. carbon equivalent.

$NO_{x_{mass}}$ = Oxides of nitrogen emissions, in grams per test phase.

$\text{Density}_{NO_2}$ = Density of oxides of nitrogen in the exhaust gas, assuming they are in the form of nitrogen dioxide, in grams per cubic foot at 68° F. and 760 mm. Hg pressure (54.16 gm./cu. ft.).

$NO_{x_{conc}}$ = Oxides of nitrogen concentration of the dilute exhaust sample corrected for background, in p.p.m.

$$NO_{x_{conc}}=NO_{x_e}-NO_{x_d}(1-1/DF)$$

where:

$NO_{x_e}$ = Oxides of nitrogen concentration of the dilute exhaust sample as measured, in p.p.m.

$NO_{x_d}$ = Oxides of nitrogen concentration of the dilution air as measured, in p.p.m.

$CO_{mass}$ = Carbon monoxide emissions, in grams per test phase.

$\text{Density}_{CO}$ = Density of carbon monoxide in grams per cubic foot at 68° F. and 760 mm. Hg pressure (32.97 gm./cu. ft.).

$CO_{conc}$ = Carbon monoxide concentration of the dilute exhaust sample corrected for background, water vapor and $CO_2$ extraction, in p.p.m.

$$CO_{conc}=CO_e-CO_d(1-1/DF)$$

where:

$CO_e$ = Carbon monoxide concentration of the dilute exhaust sample volume corrected for water vapor and carbon dioxide extraction, in p.p.m. The calculation assumes the carbon to hydrogen ratio of the fuel is 1:1.85.

$$CO_e=(1-0.01925CO_{te}-0.000323R)\,CO_{em}$$

where:

$CO_{em}$ = Carbon monoxide concentration of the dilute exhaust sample as measured in p.p.m.

$CO_{te}$ = Carbon dioxide concentration of the dilute exhaust sample, in mole percent.

$R$ = Relative humidity of the dilution air, in percent.

$CO_d$ = Carbon monoxide concentration of the dilution air corrected for water vapor extraction, in p.p.m.

$$CO_d=(1-0.000323R)\,CO_{dm}$$

where:

$CO_{dm}$ = Carbon monoxide concentration of the dilution air sample as measured, in p.p.m.

$$DF=\frac{13.4}{CO_{te}+(HC_e+CO_e)\times 10^{-4}}$$

$V_{mix}$ = Total dilute exhaust volume in cubic feet per test phase corrected to standard conditions (528°R and 760 mm. Hg).

$$V_{mix}=V_e\times N\frac{(P_B-P_1)\,(528°R)}{(760\text{ mm. }Hg)\,(T_p)}$$

where:

$V_e$ = Volume of gas pumped by the positive displacement pump, in cubic feet per revolution. This volume is dependent on the pressure differential across the positive displacement pump.

$N$ = Number of revolutions of the positive displacement pump during the test phase while samples are being collected.

$P_B$ = Barometric pressure in mm. Hg.

$P_1$ = Pressure depression below atmosphere measured at the inlet to the positive displacement pump.

$T_p$ = Average temperature of dilute exhaust entering positive displacement pump during test while samples are being collected, in degrees Rankine.

$K_H$ = Humidity correction factor.

$$K_H=\frac{1}{1-0.0047\ (H-75)}$$

where:

$H$ = Absolute humidity in grains of water per pound of dry air.

$$H=\frac{(43.478)\ R_a\times P_d}{P_B-(P_d\times R_a/100)}$$

$R_a$ = Relative humidity of the ambient air, in percent.

$P_d$ = Saturated vapor pressure, in mm. Hg at the ambient dry bulb temperature.

(d) Example calculation of mass emission values:

(1) For the "transient" phase of the cold start test assume $V_e$=0.29344 cu. ft. per revolution; $N$=10,485; $R$=48.0%; $R_a$=48.2%; $P_B$=762 mm. Hg; $P_d$=22.225 mm. Hg; $P_1$=70 mm. Hg; $T_p$=570°$R$; $HC_e$=105.8 p.p.m. carbon equivalent; $NO_{x_e}$=11.2 p.p.m.; $CO_{em}$=306.6 p.p.m.; $CO_{te}$=1.43%; $HC_d$=12.1 p.p.m.; $NO_{x_d}$=0.8 p.p.m.; $CO_{dm}$=15.3 p.p.m. Then:

$$V_{mix}=\frac{(0.29344)\ (10{,}485)\ (762-70)\ (528)}{(760)\ (570)}=2595.0\text{ cu. ft. per test phase.}$$

$$H=\frac{(43.478)\ (48.2)\ (22.225)}{762-(22.225\times 48.2/100)}.$$

$$K_H=\frac{1}{1-0.0047(62-75)}=0.9424.$$

$$CO_e=(1-0.01925(1.43)-0.000323(48))\,306.0=293.4\text{ p.p.m.}$$

$$CO_d=(1-0.000323(48))\,15.3=15.1\text{ p.p.m.}$$

$$DF=\frac{13.4}{1.43+(105.8+293.4)\times 10^{-4}}=9.116.$$

$$HC_{conc}=105.8-12.1(1-1/9.116)=95.03.$$

$$HC_{mass}=(2595)\ (16.33)\ (95.03/1{,}000{,}000)=4.027\text{ grams per test phase.}$$

$$NO_{x_{conc}}=11.2-0.8(1-1/9.116)=10.49.$$

$$NO_{x_{mass}}=(2595)\ (54.16)\ (10.49/1{,}000{,}000)\ (0.9424)=1.389\text{ grams per test phase.}$$

$$CO_{conc}=293.4-15.1(1-1/9.116)=280.$$

$$CO_{mass}=(2595)\ (32.97)\ (280/1{,}000{,}000)=23.96\text{ grams per test phase.}$$

(2) For the "stabilized" portion of the cold start test assume that similar calculations resulted in $HC_{mass}$=0.62 grams per test phase; $NO_{x_{mass}}$=1.27 grams per test phase; and $CO_{mass}$=5.98 grams per test phase.

(3) For the "transient" portion of the hot start test assume that similar calculations resulted in $HC_{mass}$=0.51 grams per test phase; $NO_{x_{mass}}$=1.38 grams per test phase; and $CO_{mass}$=5.01 grams per test phase.

(4) For a 1975 light duty vehicle:

$$HC_{wm}=((0.43)\ (4.027)+(0.57)\ (0.51)+0.62)/7.5=0.352\text{ gram per vehicle mile.}$$

$$NO_{x_{wm}}=((0.43)\ (1.389)+(0.57)\ (1.38)+1.27)/7.5=0.354\text{ gram per vehicle mile.}$$

$$CO_{wm}=((0.43)\ (23.96)+(0.57)\ (5.01)+5.98)/7.5=2.55\text{ grams per vehicle mile.}$$

**§ 85.075–27 Calculations (fuel evaporative emissions).**

The net weights of the individual collection traps employed in § 85.075–13 shall be added together to determine compliance with the fuel evaporative emission standard.

**§ 85.075–28 Compliance with emission standards.**

(a) The exhaust and fuel evaporative emission standards in § 85.075–1 apply to the emissions of vehicles for their useful life.

(b) Since emission control efficiency decreases with mileage accumulated on the vehicle, the emission level of a vehicle which has accumulated 50,000 miles will be used as the basis for determining compliance with the standards.

(c) The procedure for determining compliance of a new light duty motor vehicle with exhaust and fuel evaporative emission standards is as follows:

(1) Separate emission deterioration factors shall be determined from the emission results of the durability vehicle for each engine-system combination. A separate factor shall be established for exhaust HC, exhaust CO, exhaust $NO_x$, and fuel evaporative HC.

(i) The applicable results to be used in determining the deterioration factors for each combination shall be:

(*a*) All valid emission data from the tests required under § 85.075–7(b), except the zero mile tests. This shall include the official test results, as determined in § 85.075–29, for all tests conducted on all durability vehicles of the combination selected under § 85.075–5 (c) (including all vehicles elected to be operated by the manufacturer under § 85.075–5(c)(3)).

(*b*) All emission data from the tests conducted before and after the scheduled maintenance provided in §§ 85.075–6(a)(1)(i), (1)(iii), (3), (4), and (5)(iii).

(c) All emission data from tests required by maintenance approved under § 85.075–6(a)(1)(ix), in those cases where the Administrator conditioned his approval for the performance of such maintenance on the inclusion of such data in the deterioration factor calculation.

(ii) All applicable results shall be plotted as a function of the mileage on the system, rounded to the nearest mile, and the best fit straight lines, fitted by the method of least squares, shall be drawn through all these data points. The interpolated 4,000- and 50,000-mile points on this line must be within the standards provided in § 85.075–1 or the data will not be acceptable for use in calculation of a deterioration factor, unless no applicable data point exceeded the standard.

(iii) An exhaust emission deterioration factor shall be calculated for each combination as follows:

$$\text{factor} = \frac{\text{exhaust emissions interpolated to 50,000 miles}}{\text{exhaust emissions interpolated to 4,000 miles}}$$

These interpolated values shall be carried out to a minimum of four places to the right of the decimal point before dividing one by the other to determine the deterioration factor. The results shall be rounded to three places to the right of the decimal point in accordance with ASTM E 29–67.

(iv) An evaporative emission deterioration factor shall be calculated for each combination by subtracting the evaporative emissions interpolated to 4,000 miles from the evaporative emissions interpolated to 50,000 miles. These interpolated values shall be carried out, in accordance with ASTM E 29–67, to a minimum of three decimal places to the right of the decimal point before subtracting one from the other to determine the deterioration factor.

(2)(i) The exhaust emission test results for each emission data vehicle shall be multiplied by the appropriate deterioration factor: *Provided,* That if a deterioration factor as computed in paragraph (c)(1)(iii) is less than one, that deterioration factor shall be one for the purposes of this paragraph.

(ii) The evaporative emission test results for each combination shall be adjusted by addition of the appropriate deterioration factor: *Provided,* That if a deterioration factor as computed in paragraph (3)(1)(iv) is less than zero, that deterioration factor shall be zero for the purposes of this paragraph.

(3) The emissions to compare with the standard shall be the adjusted emissions of paragraph (c)(2)(i) and (ii) for each emission data vehicle. Before any emission value is compared with the standard, it shall be rounded, in accordance with ASTM E 29–67, to two significant figures. The rounded emission values may not exceed the standard.

(4) Every test vehicle of an engine family must comply with all applicable standards, as determined in paragraph (c)(3), before any vehicle in that family may be certified.

### § 85.075–29 Testing by the Administrator.

(a) The Administrator may require that any one or more of the test vehicles be submitted to him, at such place or places as he may designate, for the purpose of conducting emissions tests. The Administrator may specify that he will conduct such testing at the manufacturer's facility, in which case instrumentation and equipment specified by the Administrator shall be made available by the manufacturer for test operations. Any testing conducted at a manufacturer's facility pursuant to this paragraph shall be scheduled by the manufacturer as promptly as possible.

(b)(1) Whenever the Administrator conducts a test on a test vehicle, the results of that test, unless subsequently invalidated by the Administrator, shall comprise the official data for the vehicle at that prescribed test point and the manufacturer's data for that prescribed test point shall not be used in determining compliance with emission standards.

(2) Whenever the Administrator does not conduct a test on a test vehicle at a test point, the manufacturer's test data will be accepted as the official data for that test point: *Provided,* That if the Administrator makes a determination based on testing under paragraph (a) of this section, that there is a lack of correlation between the manufacturer's test equipment and the test equipment used by the Administrator, no manufacturer's test data will be accepted for purposes of certification until the reasons for the lack of correlation are determined and the validity of the data is established by the manufacturer.

(3)(i) The emission data vehicle presented to the Administrator for testing shall be calibrated within the production tolerances applicable to the manufacturer's specifications to be shown on the vehicle label (see § 85.075–35(a)(4)(iv)) as specified in the application for certification. If the Administrator determines that a vehicle is not within such tolerances, the vehicle shall be adjusted at the facility designated by the Administrator prior to the test and an engineering report shall be submitted to the Administrator describing the corrective action taken. Based on the engineering report, the Administrator will determine if the vehicle shall be used as an emission data vehicle.

(ii) If the Administrator determines that the test data developed under paragraph (b)(3)(i) would cause the emission data vehicle to fail due to excessive 4,000 mile emissions or by application of the appropriate deterioration factor, then the following procedure shall be observed:

(*a*) The manufacturer may request a retest. Before the retest, the vehicle may be readjusted to manufacturer's specifications, if these adjustments were made incorrectly prior to the first test, and other maintenance or repairs may be performed in accordance with § 85.075–6. All work on the vehicle shall be done at such location and under such conditions as the Administrator may prescribe.

(*b*) The vehicle will be retested by the Administrator and the results of this test shall comprise the official data for the emission data vehicle.

(4) If sufficient durability data are not available at the time of any emission test conducted under paragraph (a) of this section, to enable the Administrator to determine whether an emission data vehicle would fail, the manufacturer may request a retest in accordance with the provisions of paragraphs (c)(3)(i) (*a*) and (*b*) of this paragraph. If the manufacturer does not promptly make such request, he shall be deemed to have waived the right to a retest. A request for retest must be made before the manufacturer removes the vehicle from the test premises.

### § 85.075–30 Certification.

(a)(1) If, after a review of the test reports and data submitted by the manufacturer and data derived from any additional testing conducted pursuant to § 85.075–29, the Administrator determines that a test vehicle(s) conforms to the regulations of this subpart, he will issue a certificate of conformity with respect to such vehicle(s).

(2) Such certificate will be issued for such period not more than 1 model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motor vehicle covered by the certificate will meet the requirements of the Act and this subpart.

(b)(1) The Administrator will determine whether a vehicle covered by the application complies with applicable standards by observing the following relationships:

(i) A test vehicle selected under § 85.075–5(b)(2) or (4), shall represent all vehicles in the same engine family of the same engine displacement-exhaust emission control system-evaporative emission control system combination.

(ii) A test vehicle selected under § 85.075–5(b)(3) shall represent all vehicles the same in the same engine family of the same engine displacement-exhaust emission control system-transmission type-fuel system combination.

(iii) A test vehicle selected under § 85.075–5(c)(1), shall represent all vehicles of the same engine-system combination.

(2) The Administrator will proceed as in paragraph (a) of this section with respect to the vehicles belonging to an engine family all of which comply with applicable standards.

(3) If, after a review of the test reports and data submitted by the manufacturer and data derived from any additional testing conducted pursuant to § 85.075–29, the Administrator determines that one or more test vehicles of the certification test fleet do not meet applicable standards, he will notify the manufacturer in writing, setting forth the basis for his determination. Within 30 days following receipt of the notification, the manufacturer may request a hearing on the Administrator's determination. The request shall be in writing, signed by an authorized representative of the manufacturer and shall include a statement specifying the manufacturer's objections to the Administrator's determination, and data in support of such objections. If, after a review of the request and supporting data, the Administrator finds that the request raises a substantial factual issue, he shall provide the manufacturer a hearing in accordance with § 85.005 with respect to such issue.

(4) The manufacturer may, at his option, proceed with any of the following alternatives with respect to any engine family represented by a test vehicle(s) determined not in compliance with applicable standards:

(i) Request a hearing under § 85.005, or

(ii) Delete from the application for certification the vehicles represented by the failing test vehicle. (Vehicles so deleted may be included in a later request for certification under § 85.075–32.) The Administrator will then select in place of each failing vehicle an alternate vehicle chosen in accordance with selection criteria employed in selecting the vehicle that failed, or

(iii) Modify the test vehicle and demonstrate by testing that it meets applicable standards. Another vehicle which is in all material respects the same as the first vehicle, as modified, shall then be operated and tested in accordance with applicable test procedures.

(5) If the manufacturer does not request a hearing or present the required data under subparagraph (4) of this paragraph, the Administrator will deny certification.

**§ 85.075–31 Separate certification.**

Where possible a manufacturer should include in a single application for certification all vehicles for which certification is required. A manufacturer may, however, choose to apply separately for certification of part of his product line. The selection of test vehicles and the computation of test results will be determined separately for each application.

**§ 85.075–32 Addition of a vehicle after certification.**

(a) If a manufacturer proposes to add to his product line a vehicle of the same engine-system combination as vehicles previously certified but which was not described in the application for certification when the test vehicle(s) representing other vehicles of that combination was certified, he shall notify the Administrator. Such notification shall be in advance of the addition unless the manufacturer elects to follow the procedure described in § 85.075–34. This notification shall include a full description of the vehicle to be added.

(b) The Administrator may require the manufacturer to perform such tests on the test vehicle(s) representing the vehicle to be added which would have been required if the vehicle had been included in the original application for certification.

(c) If, after a review of the test reports and data submitted by the manufacturer, and data derived from any testing conducted under § 85.075–29, the Administrator determines that the test vehicle(s) meets all applicable standards, the appropriate certificate will be amended accordingly. If the Administrator determines that the test vehicle(s) does not meet applicable standards, he will proceed under § 85.075–30(b).

**§ 85.075–33 Changes to a vehicle covered by certification.**

(a) The manufacturer shall notify the Administrator of any change in production vehicles in respect to any of the parameters listed in § 85.075–5(a)(3) or § 85.075–5(b)(3), giving a full description of the change. Such notification shall be in advance of the change unless the manufacturer elects to follow the procedure described in § 85.075–34.

(b) Based upon the description of the change, and data derived from such testing as the Administrator many require or conduct, the Administrator will determine whether the vehicle, as modified, would still be covered by the certificate of conformity then in effect.

(c) If the Administrator determines that the outstanding certificate would cover the modified vehicles, he will notify the manufacturer in writing. Except as provided in § 85.075–34 the change may not be put into effect prior to the manufacturer's receiving this notification. If the Administrator determines that the modified vehicles would not be covered by the certificate then in effect, then the modified vehicles shall be treated as additions to the product line subject to § 85.075–32.

**§ 85.075–34 Alternative procedure for notification of additions and changes.**

(a) A manufacturer may, in lieu of notifying the Administrator in advance of an addition of a vehicle under § 85.075–32 or a change in a vehicle under § 85.075–33, notify him concurrently with the making of the change if the manufacturer believes the addition or change will not require any testing under the appropriate section. Upon notification to the Administrator, the manufacturer may proceed to put the addition or change into effect.

(b) The manufacturer may continue to produce vehicles as described in the notification to the Administrator for a maximum of 30 days, unless the Administrator grants an extension in writing. This period may be shortened by a notification in accordance with paragraph (c) of this section.

(c) If the Administrator determines, based upon a description of the addition or change, that no test data will be required, he will notify the manufacturer in writing of the acceptability of the addition or change. If the Administrator determines that test data will be required, he will notify the manufacturer to rescind the change within 5 days of receipt of the notification. The Administrator will then proceed as in § 85.075–32 (b) and (c), or § 85.075–33 (b) and (c) as appropriate.

(d) Election to produce vehicles under this section will be deemed to be a consent to recall all vehicles which the Administrator determined under § 85.075–32(c) do not meet applicable standards, and to cause such nonconformity to be remedied at no expense to the owner.

**§ 85.075–35 Labeling.**

(a) (1) The manufacturer of any light duty motor vehicle subject to the standards prescribed in § 85.075–1 shall, at the time of manufacture, affix a permanent, legible label, of the type and in the manner described below, containing the information hereinafter provided, to all production models of such vehicles available for sale to the public and covered by a certificate of conformity under § 85.075–30(a).

(2) A plastic or metal label shall be welded, riveted, or otherwise permanently attached in a readily visible position in the engine compartment.

(3) The label shall be affixed by the vehicle manufacturer, who has been issued the certificate of conformity for such vehicle, in such a manner that it cannot be removed without destroying or defacing the label, and shall not be affixed to any equipment which is easily detached from such vehicle.

(4) The label shall contain the following information lettered in the English language in block letters and numerals, which shall be of a color that contrasts with the background of the label:

(i) The label heading: Vehicle Emission Control Information;

(ii) Full corporate name and trademark of manufacturer;

(iii) Engine displacement (in cubic inches) and engine family identification;

(iv) Engine tuneup specifications and adjustments, as recommended by the manufacturer, including idle speed, ignition timing, and the idle air-fuel mixture setting procedure and value (e.g. idle CO, idle air-fuel ratio, idle speed drop). These specifications should indicate the proper transmission position during tuneup and what accessories (e.g., air-conditioner), if any, should be in operation;

(v) The statement: "This Vehicle Conforms to U.S.E.P.A. Regulations Applicable to 1975 Model Year New Motor Vehicles."

(b) The provisions of this section shall not prevent a manufacturer from also reciting on the label that such vehicle or engine conforms to any applicable State emission standards for new motor vehicles or any other information that such manufacturer deems necessary for, or useful to, the proper operation and satisfactory maintenance of the vehicle.

**§ 85.075–36 Submission of vehicle identification numbers.**

(a) The manufacturer of any light duty motor vehicle covered by a certificate of conformity under § 85.075–30(a) shall, not later than 60 days after its manufacture, submit to the Administrator the vehicle identification number of such vehicle: *Provided,* That this requirement shall not apply with respect to any vehicle manufactured within any State, as defined in section 302(d) of the Act.

(b) The requirements of this section may be waived with respect to any manufacturer who provides information satisfactory to the Administrator which will enable the Administrator to identify those vehicles which are covered by a certificate of conformity.

**§ 85.075–37 Production vehicles.**

(a) Any manufacturer obtaining certification under this subpart shall supply to the Administrator, upon his request, a reasonable number of production vehicles selected by the Administrator which are representative of the engines, emission control systems, fuel systems, and transmissions offered and typical of production models available for sale under the certificate. These vehicles shall be supplied for testing at such time and place and for such reasonable periods as the Administrator may require.

(b) Any manufacturer obtaining certification under this subpart shall notify the Administrator, on a quarterly basis, of the number of vehicles of each engine family-engine displacement-exhaust emission control system-fuel system-transmission type-inertia weight class combination produced for sale in the United States during the preceding quarter. A manufacturer may elect to provide this information every 60 days instead or quarterly, to combine it with the notification required under § 85.075–36.

(c) All light duty vehicles covered by a certificate of conformity under § 85.075–30(a) shall be adjusted by the manufacturer to the ignition timing specification detailed in § 85.075–35(a)(4)(iv).

**§ 85.075–38 Maintenance instructions.**

(a) The manufacturer shall furnish or cause to be furnished to the ultimate purchaser of each new motor vehicle subject to the standards prescribed in § 85.075–1, written instructions for the maintenance and use of the vehicle by the ultimate purchaser as may be reasonable and necessary to assure the proper functioning of emission control systems.

(1) Such instructions shall be provided for those vehicle and engine components listed in Appendix VI to this part (and for any other components) to the extent that maintenance of these components is necessary to assure the proper functioning of emission control systems.

(2) Such instructions shall be in clear, and to the extent practicable, nontechnical language.

(b) The maintenance instructions required by this section shall contain a general description of the documentation which the manufacturer will require from the ultimate purchaser or any subsequent purchaser as evidence of compliance with the instructions.

(3) Such instructions shall specify the performance of all scheduled maintenance performed by the manufacturer under § 85.075–6(a) and shall explain the conditions under which EGR system and catalytic converter maintenance is to be performed (e.g., what type of warning device is being employed and whether the device is activated by component failure or the need for periodic maintenance).

**§ 85.075–39 Submission of maintenance instructions.**

(a) The manufacturer shall provide to the Administrator, no later than the time of the submission required by § 85.075–4, a copy of the maintenance instructions which the manufacturer proposes to supply to the ultimate purchaser in accordance with § 85.075–38(a). The Administrator will review such instructions to determine whether they are reasonable and necessary to assure the proper functioning of the vehicle's emission control systems. The Administrator will notify the manufacturer of his determination whether such instructions are reasonable and necessary to assure the proper functioning of the emission control systems.

(b) Any revision to the maintenance instructions which will affect emissions shall be supplied to the Administrator at least 30 days before being supplied to the ultimate purchaser unless the Administrator consents to a lesser period of time.

1. In § 85.702, paragraphs (a)(18) and (a)(19) are added. As amended, the section reads as follows:

**§ 85.702 Definitions**

(a) * * *

(18) "Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of engine components or systems which is performed on a periodic basis to prevent part failure or vehicle (if the engine were installed in a vehicle) malfunction.

(19) "Unscheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of engine components or systems which is performed to correct a part failure or vehicle (if the engine were installed in a vehicle) malfunction.

2. In § 85.774–2, paragraph (a) is revised. As amended, the section reads as follows:

**§ 85.774–2 Application for certification.**

(a) An application for a certificate of conformity to the regulations applicable to any new motor vehicle engine shall be made to the Administrator by the manufacturer and shall be kept current and accurate by amendment.

* * * * *

3. In § 85.774–6, paragraphs (a)(1) and (b) are revised. As amended, the section reads as follows:

**§ 85.774–6 Maintenance.**

(a)(1) Scheduled maintenance on the engine and fuel system of durability engines shall be performed only under the following provisions and shall be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle.

* * * * *

(b) Complete emission tests (see § 85.774–10 through § 85.774–18) shall be run, unless waived by the Administrator, before and after any engine maintenance which may reasonably be expected to affect emissions. These test data shall be air posted to the Administrator within 24 hours (or delivered within three working days) after the test, along with a complete record of all pertinent maintenance, including a preliminary engineering report of any malfunction diagnosis and the corrective action taken. A complete engineering report shall be delivered or air posted to the Administrator within ten working days after the tests. In addition, all test data and maintenance reports shall be compiled and provided to the Administrator in accordance with § 85.774–4.

* * * * *

4. In § 85.774–9, paragraph (b) is revised and paragraph (d), which had been omitted, is added. As amended, the section reads as follows:

§ 85.774–9 Test procedures.

* * * * *

(b) The test is designed to determine the brake-specific emissions of hydrocarbons, carbon monoxide, and oxides of nitrogen during a truck driving pattern in a metropolitan area as stimulated on an engine dynamometer. The test consists of two warmup cycles and the hot cycles are combined to yield the reported values.

* * * * *

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle engine shall be functioning during all procedures in this subpart. Maintenance to correct component failure or malfunction shall be authorized in accordance with § 85.774–6.

5. In § 85.774–13, paragraph (b) is revised. As amended, the section reads as follows:

§ 85.774–13 Sampling and analytical system for measuring exhaust emissions.

* * * * *

(b) Component description. The following components shall be used in sampling and analytical systems for testing under the regulations in this subpart. Other types of sampling and analytical systems may be used if shown to yield equivalent results and if approved in advance by the Administrator.

* * * * *

6. In § 85.774–28, paragraph (c)(1)(ii) is revised. As amended, the section reads as follows:

§ 85.774–28 Compliance with emission standards.

* * * * *

(c) * * *

(1) * * *

(ii) All applicable results shall be plotted as a function of the hours on the system, rounded to the nearest hour, and the best fit straight lines, fitted by the method of least squares, shall be drawn through these data points. The interpolated 125- and 1,500-hour points on this line must be within the standard provided in § 85.774–1 or the data shall not be used in calculation of a deterioration factor, unless no applicable data point exceeded the standard.

* * * * *

7. In § 85.774–30, paragraphs (a)(2) and (b)(1)(ii) are revised. As amended, the section reads as follows:

§ 85.774–30 Certification.

(a) (1) * * *

(2) Such certificate will be issued for such period not more than one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motor vehicle engine covered by the certificate will meet the requirements of the Act and this subpart.

(b) (1) * * *

(ii) A test engine selected under § 85.774–5(b)(3) shall represent all engines of the same engine-system combination.

* * * * *

8. In § 85.774–33, paragraph (a) is corrected. As corrected, the section reads as follows:

§ 85.774–33 Changes to an engine covered by certification.

(a) The manufacturer shall notify the Administrator of any change in production engines in respect to any of the parameters listed in § 85.774–5(a)(3) or § 85.774–5(b)(3), giving a full description of the change. Such notification shall be in advance of the change unless the manufacturer elects to follow the procedure described in § 85.774–34.

9. In § 85.802, paragraphs (a)(23) and (a)(24) are added. As amended, the section reads as follows:

§ 85.802 Definitions.

(a) * * *

(23) "Scheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of engine components or systems which is performed on a periodic basis to prevent part failure or vehicle (if the engine were installed in a vehicle) malfunction.

(24) "Unscheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of engine components or systems which is performed to correct a part failure or vehicle (if the engine were installed in a vehicle) malfunction.

10. In § 85.874–2, paragraph (a) is revised. As amended, the section reads as follows:

§ 85.874–2 Application for certification.

(a) An application for a certificate of conformity to the regulations applicable to any new motor vehicle engine shall be made to the Administrator by the manufacturer and shall be kept current and accurate by amendment.

* * * * *

11. In § 85.874–6, paragraphs (a)(1) and (b) are revised. As amended, the section reads as follows:

§ 85.874–6 Maintenance.

(a)(1) Scheduled maintenance on the engine and fuel system of durability engines shall be performed only under the following provisions and shall be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle.

* * * * *

(b) Complete emission tests (see § 85.874–10 through § 85.874–18) shall be run, unless waived by the Administrator, before and after any engine maintenance which may reasonably be expected to affect emissions. These test data shall be air posted to the Administrator within 24 hours (or delivered within three working days) after the tests, along with a complete record of all pertinent maintenance, including a preliminary report of any malfunction diagnosis and the corrective action taken. A complete engineering report shall be delivered or air posted to the Administrator within ten working days after the tests. In addition, all test data and maintenance reports shall be compiled and provided to the Administrator in accordance with § 85.874–4.

* * * * *

12. In § 85.874–7, paragraph (e) is deleted. As amended, the section reads as follows:

§ 85.875–7 Service accumulation and emission measurements.

* * * * *

(e) [deleted]

13. In § 85.874–9, paragraph (d) is revised. As amended, this section reads as follows:

§ 85.874–9 Test procedures.

* * * * *

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle engine shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 85.874–6.

14. In § 85.874–15, paragraph (b) was omitted. As corrected, the section reads as follows:

§ 85.874–15 Instrument checks.

* * * * *

(b) The instruments for measuring and recording engine r.p.m., engine torque, air inlet restrictions, exhaust system back pressure, etc. which are used in the tests prescribed herein, shall be calibrated from time to time in accordance with good technical practice.

15. In § 85.874–28, paragraph (c)(1)(ii) is revised. As amended, the section reads as follows:

§ 85.874–28 Compliance with emission standards.

* * * * *

(c) * * *

(1) * * *

(ii) All applicable results shall be plotted as a function of the hours on the system, rounded to the nearest hour, and the best fit straight lines, fitted by the method of least squares, shall be drawn through these data points. The

interpolated 125- and 1,000-hour points on this line must be within the standard provided in § 85.874–1 or the data shall not be used in calculation of a deterioration factor, unless no applicable data point exceeded the standard.

* * * * *

16. In § 85.874–30, paragraphs (a)(2) and (b)(1)(ii) are revised. As amended, the section reads as follows:

§ 85.874–30 Certification.

(a) * * *

(1) * * *

(2) Such certificate will be issued for such period not more than one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motor vehicle engine covered by the certificate will meet the requirements of the Act and this subpart.

(b)(1) * * *

(ii) A test engine selected under § 85.874–5(b)(3) shall represent all engines of the same engine-system combination.

* * * * *

17. In § 85.874–33, paragraph (a) is corrected. As corrected, the section reads as follows:

§ 85.874–33 Changes to an engine covered by certification.

(a) The manufacturer shall notify the Administrator of any change in production engines in respect to any of the parameters listed in § 85.874–5(a)(3) or § 85.874–5(b)(3), giving a full description of the change. Such notification shall be in advance of the change unless the manufacturer elects to follow the procedure described in § 85.874–34.

18. In § 85.902, paragraphs (a)(23) and (a)(24) are added. As amended, the section reads as follows:

§ 85.902 Definitions.

(a) * * *

(23) "Unscheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of engine components or systems which is performed on a periodic basis to prevent part failure of vehicle (if the engine were installed in a vehicle) malfunction.

(24) "Unscheduled maintenance" means any adjustment, repair, removal, disassembly, cleaning, or replacement of engine components or systems which is performed to correct a part failure or vehicle (if the engine were installed in a vehicle) malfunction.

19. In § 85.974–2, paragraph (a) is revised. As amended, the section reads as follows:

§ 85.974–2 Application for certification.

(a) An application for a certificate of conformity to the regulations applicable to any new motor vehicle engine shall be made to the Administrator by the manufacturer and shall be kept current and accurate by amendment.

* * * * *

20. In § 85.974–6, paragraphs (a)(1) and (b) are revised. As amended, the section reads as follows:

§ 85.974–6 Maintenance.

(a)(1) Scheduled maintenance on the engine and fuel system of durability engines shall be performed only under the following provisions and shall be specified in the manufacturer's maintenance instructions furnished to the ultimate purchaser of the motor vehicle.

* * * * *

(b) Complete emission tests (see § 85.974–10 through § 85.974–18) shall be run, unless waived by the Administrator, before and after any engine maintenance which may reasonably be expected to affect emissions. These test data shall be air posted to the Administrator within 24 hours (or delivered within three working days) after the tests, along with a complete record of all pertinent maintenance, including a preliminary engineering report of any malfunction diagnosis and the corrective action taken. A complete engineering report shall be delivered or air posted to the Administrator within ten working days after the tests. In addition, all test data and maintenance reports shall be compiled and provided to the Administrator in accordance with § 85.974–4.

* * * * *

21. In § 85.974–7, paragraphs (g) and (h), which had been omitted, are revised, and the paragraph previously appearing as (g) properly appears in § 85.974–9. As amended, the section reads as follows:

§ 85.974–7 Service accumulation and emission measurements.

* * * * *

(g)(1) The Administrator may elect to operate and test any test engine during all or any part of the service accumulation and testing procedure. In such cases, the manufacturer shall provide the engine(s) to the Administrator with all information necessary to conduct the testing, and the Administrator will conduct the complete emission test (§ 85.974–9 through § 85.974–18) at such test point. Maintenance may be performed by the manufacturer under such conditions as the Administrator may prescribe.

(2) The data developed by the Administrator for the engine-system combination shall be combined with any applicable data supplied by the manufacturer on other engines of that combination to determine the applicable deterioration factors for the combination. In the case of a significant discrepancy between data developed by the Administrator and that submitted by the manufacturer, the Administrator's data shall be used in the determination of deterioration factors.

(h) A break-in procedure, not to exceed 20 hours, may be run if approved in writing in advance by the Administrator. This procedure would be run after the 0 hour test, and the hours accumulated would not be counted as part of the service accumulation.

22. In § 85.974–9, paragraph (d), which had been omitted, is revised. As corrected and amended, the section reads as follows:

§ 85.974–9 Test procedures.

* * * * *

(d) Except in cases of component malfunction or failure, all emission control systems installed on or incorporated in a new motor vehicle engine shall be functioning during all procedures in this subpart. Maintenance to correct component malfunction or failure shall be authorized in accordance with § 85.974–6.

23. In § 85.974–13, paragraph (a) is revised. As amended, the section reads as follows:

§ 85.974–13 Sampling and analytical methods.

(a) The determination of the carbon monoxide and nitric oxide concentrations shall be accomplished using sampling and analysis components as specified in Sections 2.1 and 2.2 of the SAE Recommended Practice No. J177 titled, "Measurement of Carbon Dioxide, Carbon Monoxide and Oxides of Nitrogen in Diesel Exhaust," dated June 1970. Other sampling and analysis components may be used if shown to yield equivalent results and if approved in advance by the Administrator.

* * * * *

24. In § 85.974–16, paragraph (b)(6) is revised. As amended, the section reads as follows:

§ 85.974–16 Test run.

* * * * *

(b) * * *

(6) Start the test sequence of § 85.974–11. Operate the engine for 10 minutes in each mode, completing engine speed and load changes in the first minute. If a delay of more than 10 minutes occurs between the end of one mode and the start of the next mode, discontinue the sequence and repeat the test from Mode No. 1. Record the response of the analyzers on a strip chart recorder for the full 10 minutes with exhaust gas flowing through the analyzers at least during the last 5 minutes. Record the engine speed and load, intake air temperature and restriction, exhaust back pressure, fuel flow and air or exhaust flow during the last 5 minutes of each mode, making certain that the speed and load requirements of § 85.974–11(b) are met during the last minute of each mode. Fuel flow during idle or 2 percent load conditions may be determined just prior to or immediately following the dynamometer, sequence, if longer times are required for accurate measurements.

25. In § 85.974–18, paragraph (c) is revised. As amended, the section reads as follows:

**§ 85.974–18 Calculations.**

* * * * *

(c) Multiply the corrected nitric oxide values by the following humidity correction factor:

$$\frac{1}{1+A\,(H-75)+B\,(T-85)}$$

Where:

A = 0.044 (F/A) − 0.0038
B = 0.116 (F/A) = 0.0053
H = humidity of the inlet air in grains of water per pound of dry air
T = temperature of the air in F.
F/A = Fuel-air ratio (dry air basis)

* * * * *

26. In § 85.974–28, paragraph (c) (1) (ii) is revised. As amended, this section reads as follows:

**§ 85.974–28 Compliance with emission standards.**

* * * * *

(c) * * *

(1) * * *

(ii) All applicable results shall be plotted as a function of the hours on the system, rounded to the nearest hour, and the best fit straight lines, fitted by the method of least squares, shall be drawn through these data points. The interpolated 125- and 1,000-hour points on this line must be within the standard provided in § 85.974–1 or the data shall not be used in calculation of a deterioration factor, unless no applicable data point exceeded the standards.

* * * * *

27. In § 85.974–30, paragraphs (a) (2) and (b) (1) (ii) are revised. As amended, the section reads as follows:

**§ 85.974–30 Certification.**

(a) * * *

(2) Such certificate will be issued for such period not more than one model year as the Administrator may determine and upon such terms as he may deem necessary to assure that any new motor vehicle engine covered by the certificate will meet the requirements of the Act and this subpart.

(b) (1) * * *

(ii) A test engine selected under § 85.974–z(b) (3) shall represent all engines of the same engine-system combination.

* * * * *

28. In § 85.974–33, paragraph (a) is corrected. As corrected, the section reads as follows:

**§ 85.974–33 Changes to an engine covered by certification.**

(a) The manufacturer shall notify the Administrator of any change in production engines in respect to any of the parameters listed in § 85.974–5(a) (3) or § 85.974–5(b) (3), giving a full description of the change. Such notification shall be in advance of the change unless the manufacturer elects to follow the procedure described in § 85.974–34.

* * * * *

29. In § 85.1602, paragraph (a) (3) (ii) is corrected. As amended, the section reads as follows:

**§ 85.1602 Low-emission vehicle.**

(a) * * *

(3) * * *

(ii) Carbon monoxide. 28 grams per vehicle mile;

* * * * *

30. Appendix III is revised as follows:

APPENDIX III

The following calibration procedure outlines the equipment, the test setup configuration, and the various parameters which must be measured to establish the flow rate of the constant volume sampler pump. All the parameters related to the pump are simultaneously measured with the parameters related to a flowmeter which is connected in series with the pump. The calculated flow rate ($ft^3$/rev @ pump inlet absolute pressure and temperature) can then be plotted versus a correlation function which is the value of a specific combination of pump parameters. The linear equation which relates the pump flow and the correlation function is then determined. In the event that a CVS has a multiple speed drive, a calibration for each range should be performed.

This calibration procedure is based on the measurement of the absolute values of the pump and flowmeter parameters that relate the flow rate at each point. Three conditions must be maintained to assure the accuracy and integrity of the calibration curve. First, the pump pressures should be measured at taps on the pump rather than at the external piping on the pump inlet and outlet. Pressure taps that are mounted at the top and bottom center of the pump drive headplate are exposed to the actual pump cavity pressures, and therefore reflect the absolute pressure differentials. Secondly, temperature stability must be maintained during the calibration. The laminar flowmeter is sensitive to inlet temperature oscillations which cause the data points to be scattered. Gradual changes (± 2°F) in temperature are acceptable as long as they occur over a period of several minutes. Finally, all connections between the flowmeter and the CVS pump must be absolutely void of any leakage.

During a CVS emissions test the measurement of these same pump parameters enables the user to calculate the flow rate from the calibration equation.

After the calibration curve has been obtained, a verification test of the entire system can be performed by injecting a known mass of gas into the system and comparing the mass indicated by the system to the true mass injected. An indicated error does not necessarily mean that the calibration is wrong, since other factors can influence the accuracy of the system.

Equipment:

The following list of equipment will be needed to perform this calibration procedure. Figure 1 illustrates a typical equipment arrangement used for calibration. All of the equipment involved should conform to the range and accuracy as specified in Figure 1.

Equipment List:

1. LFE—Laminar Flowmeter
2. Micromanometer
3. Thermometer
4. Timer
5. U-Tube Manometers
6. Temperature Indicator with type J Thermocouples
7. A variable flow restrictor with appropriate piping to connect the CVS pump and LFE.

After the system has been connected as shown in Figure 1, set the variable restrictor in the wide open position and run the CVS pump for twenty minutes. Record the calibration data.

CALIBRATION DATA MEASUREMENTS

| Parameter | Symbol | Units | Tolerance |
|---|---|---|---|
| Barometric Pressure (Corrected) | $P_B$ | "Hg | ±.01 "Hg. |
| Ambient Temperature | $T_A$ | °F | ±.5 °F. |
| Air temperature into LFE | ETI | °F | ±.1 °F. |
| Pressure depression upstream of LFE | EPI | "$H_2O$ | ±.05 "$H_2O$. |
| Pressure drop across the LFE matrix | EDP | "$H_2O$ | ±.005 "$H_2O$. |
| Air temperature at CVS pump inlet | PTI | °F | ±.5 °F. |
| Pressure depression at CVS pump inlet | PPI | "Fluid | ±.05 "Fluid. |
| Specific gravity of manometer fluid | Sp. Gr. | | |
| Pressure head at CVS pump outlet | PPO | "Fluid | ±.05 "Fluid. |
| Air temperature at CVS pump outlet (Optional) | PTO | °F | ±.5 °F. |
| Pump revolutions during test period | N | Revs | None. |
| Elapsed time for test period | t | Secs | ±.05 Secs. |

*Note: The fluid level in the manometer tube should stabilize before the reading is made and the elapsed time for revolution counting should be greater than 120 seconds.

Reset the restrictor valve to a more restricted condition in an increment of pump inlet depression (aout 4" $H_2O$) that will yield a minimum of six data points for the total calibration.

Allow the system to stabilize for 3 minutes and repeat the data acquisition.

Data Analysis:

The data recorded during the calibration are to be used in the following calculations.

1. The air flow rate at each test point is calculated in standard cubic feet per minute (Qs) from the flowmeter data using the manufacturer's prescribed method.

2. The air flow rate is then converted to pump flow, Vo, in cubic feet per revolution at absolute pump inlet temperature and pressure.

$$V_o = \frac{Qs}{n} \times \frac{T_p}{530} \times \frac{29.92}{P_p}$$

Where:

Qs = Meter air flow rate in standard cubic feet per minute (flowmeter standard conditions are 70°F, 29.92 "Hg).

n = Pump speed in revolutions per minute.

$P_p$ = Absolute pump inlet pressure, in ("Hg).

$P_p = P_B - PPI$ (SP.GR./13.57), $T_p = PTI + 460$.

3. The correlation function at each test point is then calculated from the calibration data, as follows:

$$X_o = \frac{1}{n}\sqrt{\frac{\Delta P_p}{P_e}}$$

Where:

$\Delta P_p$ = The pressure differential from pump inlet to pump outlet, in ("Hg). $\Delta P_p = P_e - P_p$.

$P_e$ = Absolute pump outlet pressure, in ("Hg).

$P_e = P_B + PPO$ (SP.GR./13.57).

See § 85.074–26 for other definitions.

4. A linear least squares fit is performed to generate the calibration equations which have the forms

$$V_o = D_o - M(X_o)$$
$$n = A - B(\Delta P_p)$$

Do, M, A, and B are the slope-intercept constants describing the lines.

A CVS system that has multiple speeds should be calibrated on each speed used. The calibration curves generated for the ranges will be approximately parallel and the intercept values, $D_o$, will increase as the pump flow range decreases.

If the calibration has been performed carefully, the calculated $V_o$ values from the equation will be within ±.50% of the measured value of $V_o$. Values of M will vary from one pump to another, but values of $D_o$ for pumps of the same make, model, and range should agree within ±3% of each other. Particulate influx from use will cause the pump slip to decrease as reflected by lower values for M. Calibrations should be performed at 0, 50, 100, 200, 400, etc. hours of pump operation to assure the stability of the pump slip rate. Analysis of mass injection data will also reflect pump slip stability.

CVS System Verification:

The following technique can be used to verify that the CVS and analytical instruments can accurately measure a mass of gas that has been injected into the system.

1. Otain a small cylinder that has been charged with pure propane or carbon monoxide gas (caution—carbon monoxide is poisonous!). Critical flow orifice devices can also be used for constant flow metering.

2. Determine a reference cylinder weight to the nearest 0.01 gram.

3. Operate the CVS in the normal manner and release a quantity of pure propane or carbon monoxide into the system during the sampling period.

4. The calculations of § 85.074–26 are performed in the normal way except, in the case of propane, the density of propane (17.30 grams/cu. ft./carbon atom) is used in place of the density of exhaust hydrocarbons. In the case of carbon monoxide, the density of 32.97 grams/cu. ft. is used.

5. The gravimetric mass is subtracted from the CVS measured mass and then divided by the gravimetric mass to determine the percent accuracy of the system.

6. The cause for any discrepancy greater than ±2% should be found and corrected. The following list of parametric errors may assist the operator in locating the cause of large errors.

Positive Error (Indication is higher than true value):

1. Calculated $V_o$ is greater than actual $V_o$.

a. Original calibration in error.

2. Pump inlet temperature recorder is reading low. A 6° F. discrepancy will give a 1% error.

3. Pump inlet pressure indicator is reading high. A 3.5 in. $H_2O$ high reading will give 1% error.

4. Background concentration reading is too low. Check analyzer zero. Check leakage at floor inlet.

5. Analyzer is reading high. Check span.

6. Barometer reading is in error (too high). Barometric pressure reading should be gravity and temperature corrected.

7. Revolution counter is reading high (Check pump speed and counters.)

8. Mixture is stratified causing the sample to be higher than the average concentration in the mixture.

Negative Error (Indication is lower than true value):

1. Calculated $V_o$ is less than actual $V_o$.

a. Original calibration in error.

b. Pump clearances decreased due to influx of some surface adherent material. Recalibration may be needed.

2. Pump inlet temperature recorder is reading high.

3. Pump inlet pressure indicator is reading low.

4. Background concentration reading is too high.

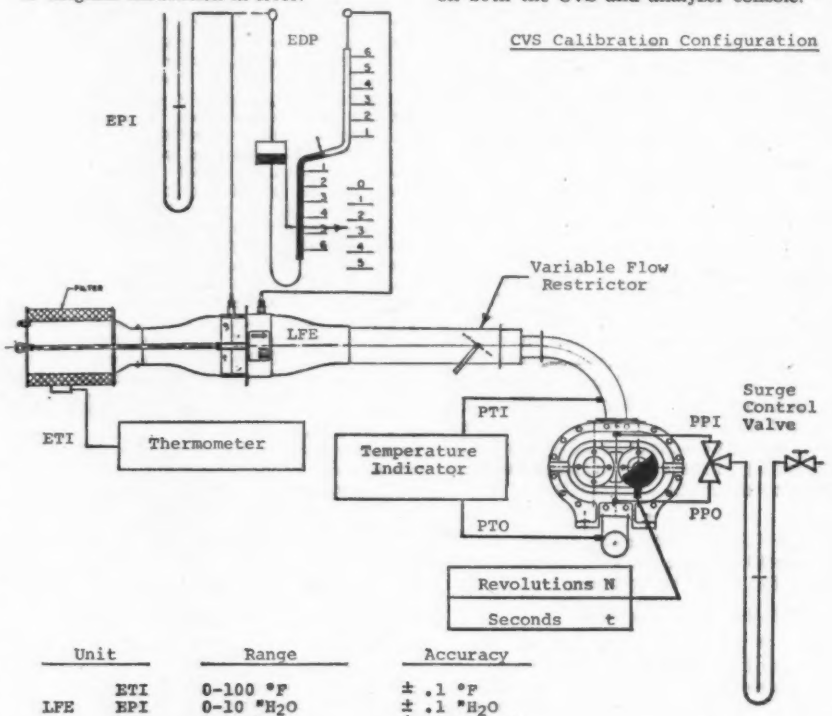
5. Analyzer is reading low.

6. Barometer reading is in error (too low).

7. Revolution counter is reading low.

8. There is a leak into the sampling system. Pressure check the lines and fittings on the intake side of sample transfer pumps on both the CVS and analyzer console.

CVS Calibration Configuration




| Unit | | Range | Accuracy |
|---|---|---|---|
| | ETI | 0-100 °F | ± .1 °F |
| LFE | EPI | 0-10 "$H_2O$ | ± .1 "$H_2O$ |
| | EDP | 0-10 "$H_2O$ | ± .005 "$H_2O$ |
| | PTI | 0-250 °F | ± .5 °F |
| | PPI | 0-36 "Fluid | ± .05 "Fluid |
| | PPO | 0-36 "Fluid | ± .05 "Fluid |
| Pump | PTO | 0-250 °F | ± .5 °F |
| | N | 0-100,000 | ± 0 |
| | t | 0-10,000 secs. | ± .05 secs. |

**Note: Fluid used in 36 inch manometer should extend range to at least 0-60 "$H_2O$. Separate manometers for PPI and PPO may be used during calibration.**

[FR Doc.73-12968 Filed 6-27-73;8:45 am]

*Just Released*

# CODE OF FEDERAL REGULATIONS

(Revised as of April 1, 1973)

Title 21—Food and Drugs (Parts 130–140)---------- $3.00

Title 21—Food and Drugs (Parts 141–169)---------- 5.50

Title 22—Foreign Relations---------- 4.25

*[A Cumulative checklist of CFR issuances for 1973 appears in the first issue of the Federal Register each month under Title 1]*

**Order from Superintendent of Documents,
United States Government Printing Office,
Washington, D.C. 20402**